THE

AMERICAN JOURNAL

OF THE MEDICAL SCIENCES.

JULY, 1902.

PROGNOSIS AND TREATMENT OF TUBERCULAR PERITONITIS,

AS BASED ON THE EXPERIENCE OF THE MASSACHUSETTS GENERAL HOSPITAL FOR THE PAST TEN YEARS.[1]

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"THE termination of tuberculous peritonitis is always fatal, either from the disease itself or from tuberculosis of the lungs or other organs. The duration is from one or two months to a year or more." So said Austin Flint in his *Practice of Medicine*, and, curiously enough, the editors of the editions which have appeared since Dr. Flint's death seem to have overlooked this statement and have left it unchanged. We now know as well as we can know almost anything in medicine that tuberculous peritonitis not infrequently gets well. For this important increase in knowledge we are indebted indirectly to Ephraim McDowell, who blazed the path to the operative treatment of ovarian disease. Spencer Wells operated on a young woman, the subject, as he supposed, of an ovarian cyst. He found the peritoneum universally studded with miliary granules resembling those of tuberculosis, sewed up the belly as fast as he could, and, to his surprise, the patient recovered, afterward marrying and becoming the mother of a family. Other ovariotomists had similar experiences, and thus cut the ground from under the feet of those who maintained that recovery from tuberculous peritonitis was proof of an error in diagnosis.

Thus modern surgery proved the curability of tuberculous peritonitis, not the least of its services to humanity.

[1] Read at the meeting of the Association of American Physicians, in Washington, April 30 1902.

The next step from the demonstration of curability by surgical intervention to its curative action was a wholly natural one, and attempts were, of course, made to explain how the action is curative. None of these explanations are really explanatory, as far as I know. Flint's statement is doubly inaccurate, for not only is tuberculous peritonitis not always fatal, but the subject may recover if parts or organs other than the peritoneum are also involved in the disease.

For some time the evidence has seemed to warrant the belief that somehow surgery may cure when all other treatment fails. The wish to obtain guidance as to which cases are adapted to medical, which to surgical, treatment; when to abandon medical for surgical treatment —the hope that I might secure more fixed therapeutic principles, useful to myself and possibly to others—led me to the following analysis of the medical and surgical records of the Massachusetts General Hospital for the past ten years. For this opportunity I wish here to thank my colleagues on the hospital staff; for indispensable and laborious assistance Dr. W. H. Smith, of Boston. The amount of work involved in such an investigation, especially when end-results are sought from hospital patients, is fully appreciated only by those who have personally pursued it.

From 1889 to 1900 there have been 98 cases of tubercular peritonitis treated at the Massachusetts General Hospital, either on the medical or surgical side. An attempt has been made to ascertain the end result in as many of these cases as possible. Including those patients who were discharged dead, and those in regard to whose condition replies have been received, the end-result is known in 57 cases, or in 58.1 per cent. In the cases included in this series the shortest time which has elapsed since the patient left the hospital is two years, the longest eleven years.

The more important facts in regard to these cases may be of interest, as serving to show the character of cases which have made up the series.

Age.				*Age.*			
From 1 to 5	. . . .	6		From 40 to 50	. . . .	5	
" 5 " 10	. . . .	7		" 50 " 60	. . . .	1	
" 10 " 15	. . . .	8		" 60 " 70	. . . .	2	
" 15 " 20	. . . .	17				—	
" 20 " 30	. . . .	39				98	
" 30 " 40	. . . .	13					

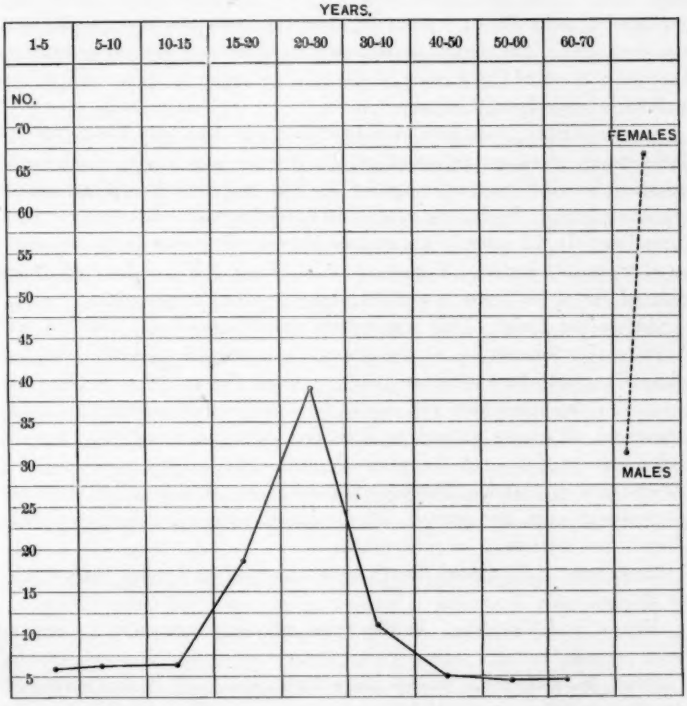
Between the ages of fifteen and thirty years there were 56 cases, or 57.1 per cent. of the whole number. The youngest case was thirteen months; the oldest case was sixty-two years.

The above list does not fairly represent the frequency of the disease in childhood, as the number of children entering the Massachusetts General Hospital is relatively small. In 1889 the number of children admitted was 43, the number of adults 3419. In 1899 the number of

children admited was 348, the number of adults 4468. Speaking broadly, the number of children admitted during the years 1889 to 1900 averaged about 4 per cent. of the total number admitted.

Americans	62
Foreign	31
Not stated	5
	98
Number of males	31
Number of females	67
	98

Included in this number were six of the colored race.



Family History. The presence of tuberculosis in the family history is recorded as follows:

In 2 cases the mother died of phthisis; in 7 cases the father died of phthisis; in 2 the father died of lung trouble; 1 had one brother die of phthisis; 1 had two brothers die of phthisis; 1 had two aunts die of phthisis, and 1 had one aunt die of phthisis; 1 had a mother and sister,

and 1 a mother and brother die of phthisis; 1 had a sister and brother die of hydrocephalus; 1 had a mother die of phthisis and a sister of meningitis; 1 had a father die of fistula in ano; 1 had a husband die of phthisis; in 20 cases there seems to be a distinct history of tuberculosis in the family. In 1 association with a tuberculous husband was recorded.

Previous History. With our present belief in the possible tubercular origin of many if not most of the primary pleurisies, it has seemed best to note a previous attack of pleurisy when stated: One pleurisy, eight months previous; 1 pleurisy, seven years ago; Pott's disease three years ago; 1 pleurisy, eleven months previous; 1 pleurisy, one year ago; 1 pleurisy, three years ago; 1 pleurisy, seven years ago, repeated attacks since; 1 pleurisy, eleven months previous; 1 pleurisy, one year ago. The record states that 3 of these had effusion, requiring tapping; 3 out of the 8 cases of pleurisy occurred in those with tuberculosis in their family history.

Symptomatology. It is extremely difficult to draw any hard and fast lines as to whether the onset of the disease was acute or gradual; patients showing upon examination evident ascites or abdominal masses would date their beginning symptoms to abdominal pain of a few days' duration. In 66 cases it is stated as of gradual onset; in 29 as acute; in 3 it is not stated. Tightness of clothing may be the first thing noticed, or, as in 1 case, pregnancy may be thought present.

Abdominal Pain. This was noticed in 68 cases. One patient, not included in this series, as the operation occurred in 1900, had had abdominal pain for seventeen years, or since the age of eighteen. At operation the intestines and omentum were bound together by firmly organized adhesions extending into the pelvis, matting together the tubes and ovaries. On the parietal peritoneum several small calcified tubercles were found. The pathological report of a small piece of the peritoneum over the cæcum filled with minute grayish granulations showed the process to be tuberculous.

Diarrhœa. In 23 cases diarrhœa is recorded as present for a longer or shorter time.

Nausea and Vomiting. In 28 cases nausea or nausea and vomiting were present.

Fluid in Abdomen. In 63 cases there was fluid in the peritoneal cavity. In 26 cases the abdomen was tapped, either for relief or for diagnosis. The character of the fluid obtained either at tapping or at operation was as follows: In 22 cases it was clear; in 6 it was bloody or slightly bloody; in 1 case it was high in color; in 5 cases pus was present; in 1 case it was chylous; in 4 it was greenish; in 2 it was brown; in 1 turbid. In 14 cases the specific gravity of the fluid is recorded. The highest was 1035; the lowest, 1008. In 10 of the 14

cases the specific gravity was above 1020. The highest percentage of albumin was 3.4 per cent.; the lowest, 0.1 per cent.

Masses. Masses are recorded as present in 29 cases. On the right side, 5; right hypochondrium, 2; right iliac region, 4; right epigastrium, 1. On the left side, 1; left hypochondrium, 1; left low down, 1; left iliac region, 1. At umbilicus, 1; right and left umbilicus, 1; below umbilicus, 2; right to umbilicus, 1. Above pubes, 1; between recti, 1; in psoas, 1; iliac region, 1; in 4 not stated.

Crepitation. In 1 case it is reported present after tapping. One record states doubtful crepitation; 1 friction over the surface of the liver.

The superficial abdominal veins were dilated notably in 2 cases, both in children.

Tuberculin Reaction. In 13 cases tuberculin was injected as an aid to diagnosis. In 8 cases the reaction was positive; in 3 negative, and in 1 not satisfactory. In 1 other case reported as negative the temperature was irregular when it was given, and the reaction was considered negative. The use of tuberculin in relatively so small a number of the cases is due to the fact that its earliest use in this series was in 1896; that it is used practically in only one of the medical services. Its use is also limited by the fact that it can only be employed in those cases, the four-hourly chart of which shows slight rise of temperature above the normal. The preparation used is a 1 per cent. solution of Koch's 10 per cent. tuberculin. The dose now given is from 7 to 10 minims. Reaction consists in a rise in temperature (it may reach 105) with constitutional disturbance, as chilliness, headache, pain in the back, or malaise. That a negative reaction may at times be of diagnostic value is well illustrated by the following cases:

One patient in whom the probable diagnosis of tubercular peritonitis was made had two tuberculin injections without reaction. Operation showed no tuberculosis of the peritoneum. She died one month later of probable renal disease.

Another patient discharged relieved, with diagnosis of tubercular peritonitis, did not react to tuberculin. She had a recurrence of symptoms later, and was operated upon at another hospital, and an adenocystoma of the ovary was found; she has since been well.

Leucocytosis. If we accept 10,000 white cells as within normal limits, where the blood-counts were made at all hours of the twenty-four, and under the most varied conditions, there were 34 out of a total of 46 cases which were below this number, or, 70.8 per cent. which had no leucocytosis. Where the white count is above 10,000, pus may or may not be present; if present it may be sterile, or it may contain a variety of organisms. One case with a white count of 13,000 contained streptococci and bacilli. One with 14,000 white cells

was sterile. One of 11,000 contained the colon bacillus. In 3 cases where the leucocyte count was above 10,000, pus tubes were also present at the operation. The blood was otherwise not remarkable beyond an occasional moderate secondary anæmia.

Diazo. In 12 cases the diazo-reaction was present. The test is practically limited to the medical sides. It may be more or less constant, fleeting, or absent. It seems to be of but little practical significance in this series of cases. It has occurred in cases with high temperature and in cases with normal or subnormal temperature.

Temperature. There is nothing characteristic about the temperature charts in the series. In 48 cases the temperature, as a rule, was above 100. In the remaining cases the range of temperature was from normal to 100, or from subnormal to normal with slight variations. The temperature was usually higher in the evening, occasionally reaching 104, rarely 105.

Stay in Hospital. The longest stay of any patient in the hospital in this series was 347 days; the shortest two days. The average stay was 43.5 days.

In brief, in the 98 cases of tubercular peritonitis over one-half occurred between the ages of fifteen and thirty years, and two-thirds of the patients were females. In about one-fifth there seemed to be a distinct tubercular family history, while one-twelfth had had previous pleurisy. In two-thirds of the cases the onset was gradual; in about two-thirds abdominal pain and ascites were present, while about one-quarter had diarrhœa and one-quarter nausea or nausea and vomiting. In a little less than one-third of the cases abdominal masses were present. In 8 out of 13 cases the tuberculin reaction was positive, and in two-thirds of the cases there was no leucocytosis. The diazo-reaction seemed to be unimportant in this series, and the temperature to show nothing characteristic.

The cases have been divided into medical and surgical. Many of the cases entered on the medical side and were transferred to the surgical for operation; a few entered the surgical side and were transferred to the medical. There were 46 cases which are included under medical; there were 52 cases under surgical.

MEDICAL CASES.—Condition at discharge.

Relieved or improved	16	Well	2
Much relieved	6	Dead	7
Not relieved	10		—
Against advice or ?	5		46

SURGICAL CASES.—Condition at discharge.

Relieved or improved	24	Well	4
Much relieved	14	Dead	6
Not relieved	1		—
Against advice or ?	3		52

Of the 46 medical cases the end-result is known in 25; of the 52 surgical cases the end-result is known in 32; out of 98 medical and surgical cases the end-result is known in 57 cases, or 58.1 per cent.

The prognosis in a sense may be said to depend on the diagnosis. That there is liability of error in the diagnosis of tubercular peritonitis may be inferred from the fact that the following cases have been considered as cases of tuberculosis of the peritoneum—the mistake has been shown at operation or at autopsy: Tuberculosis of retroperitoneal glands and pericardium; fibroma of ovary; lymphosarcoma of mesenteric glands and intestines, with perforation and general peritonitis; schirrhus cancer of the stomach with cancerous peritonitis; retention cysts with chronic peritonitis; colloid carcinoma; adenocystoma of ovary. Several of the cases, especially in the earlier part of the series entering with high temperature, abdominal distention, absence of leucocytosis, with diazo, were at first considered to be cases of typhoid.

The prognosis as to life, if estimated from the hospital mortality, would be good in about 87 per cent. of the cases in this series. Seven cases died in the hospital out of 46 treated on the medical side, and 6 died out of the 52 treated on the surgical side; 13 in all out of 98 cases, a mortality of 13.2 per cent. A more accurate prognosis as to life can be formed by estimating the mortality from the whole number of cases in which the end-result is known. In 57 of the whole number of 98 cases the end-result has been obtained, covering a period of from two to eleven years after discharge from the hospital. The list follows:

Medical. Of the 16 cases discharged relieved or improved from the medical side, 9 have been heard from, 4 have died, 2 are well, and 3 have had no return of symptoms. Of 6 discharged much relieved, 2 have been heard from; both have died. Of 10 discharged not relieved, 6 have been heard from, 4 have died, 2 are well. Of 5 discharged against advice or ? none have replied. One well at discharge had a recurrence, but is now well. Of 46 medical cases, including those who were discharged dead and those who have died outside, there have been 17 deaths, or 36.9 per cent. Of 25 medical cases in which the end-result is known, 17 have died, or 68 per cent.

1. Uncomplicated	Died at home in a few months.
2. Tubercular peritonitis and phthisis .	Discharged dead.
3. Uncomplicated	Died at home; brain fever six months.
4. Tubercular peritonitis and pleurisy .	Discharged dead.
5. Tubercular peritonitis (pleurisy one year before).	Died outside in one month.
6. Uncomplicated	Died in three and a half years of phthisis.
7. Tubercular peritonitis and nephritis? .	Discharged dead.
8. Tubercular peritonitis, phthisis, and nephritis.	Died at home in a few weeks.
9. Uncomplicated	Dead four months; general tuberculosis and cirrhosis of liver.

10. Uncomplicated	Died four years. Cause?
11. Uncomplicated	Discharged dead.
12. Tubercular peritonitis and tubercular pleurisy.	Discharged dead. Autopsy: Chronic tuberculosis and pleural peritonitis.
13. Tubercular peritonitis, cardio-renal .	Discharged dead. Autopsy: Tubercular peritonitis, tubercular liver, chronic nephritis, and hypertrophied heart.
14. Tubercular peritonitis, glandular . .	Dead four years.
15. Tubercular peritonitis, phthisis? and fistula.	Dead a few months.
16. Tubercular peritonitis and phthisis .	Dead four months.
17. Tubercular peritonitis, fistula from tapping, and rhachitis.	Discharged dead. Autopsy: Tubercular peritonitis, focal tubercular liver, spleen and kidneys; tubercular mediastinum and post-mesenteric glands; no ulcers in intestines; puncture wound of abdomen.

The high mortality of 68 per cent. of those patients having received only medical treatment may in part be accounted for by the fact that in only 6 of these cases was the tubercular peritonitis uncomplicated, as shown by physical examination during their stay in the hospital. The other 11 cases showed one or more of the following complications: Phthisis, fistula, tubercular glands, rickets, pleurisy, cardiac or renal disease. Three cases in which post-mortem examinations were obtained also showed evidence of tubercular infection elsewhere.

Surgical. Of 24 cases discharged relieved or improved, 11 have been heard from, 3 are dead, 1 has had a recurrence and is now better, 7 are well. Of 14 cases discharged much relieved, 10 have been heard from—2 are dead, 1 is better, and 7 are well; 1 case discharged not relieved, died within one month. Of 3 cases discharged against advice, or (?) 1 replied and was well two years later. Of 4 cases discharged well, 3 have reported well. Of 52 cases surgical, including those discharged dead and those who died outside, there have been 12 deaths, or 23 per cent.

1. Discharged dead, ten weeks after operation; pus and fecal fistula.
2. Discharged dead. Sinus persisted, and died twenty-four hours after second operation.
3. Discharged dead, twenty-four hours after operation. Autopsy: Tubercular peritonitis, local peritonitis, healed focus in lung.
4. Discharged dead, twelve hours after operation.
5. Discharged dead, eleven days after operation; peritonitis and fecal fistula.
6. Discharged dead, seven weeks after operation; early autopsy record not to be found.
7. Discharged, relieved or improved. Dead three months; general sloughing of wound (gall-bladder).
8. Discharged, relieved or improved. Dead two months; fluid returned, tapped.
9. Discharged, relieved or improved. Dead four yrs.; tuberculosis of pleura and peritoneum.
10. Discharged, much relieved. Dead four months; "bowels decayed."
11. Discharged, much relieved. Dead nine months; phthisis.
12. Discharged, not relieved. Dead one month (?); (gall-bladder).

The prognosis as to life when viewed from the end-result obtained in 57 cases of this same series gives a mortality of 47.3 per cent. (2 cases in which the cause of death is doubtful have been excluded), instead of the hospital mortality of 13.2 per cent.

It is interesting to note that of the 16 cases which have died since leaving the hospital, 10 died within a few weeks or months of the time of discharge. Four years was the longest period that any of these patients lived after discharge.

Prognosis as to Recovery. Of the 8 cases heard from treated medically in which there has been no return or which are now well, the length of time intervening is as follows:

1 well 11 years			
1 recurrence 1 year later, now well 7 years	. .	or	1 patient 11 years.
1 no returns 5 years	. .	"	1 " 7 "
1 good health 5 years	. .	"	2 patients 5 "
1 well 3 years	. .	"	2 " 3 "
1 good health 3 years	. .	"	2 " 2 "
1 no return 2 years 3 months.			
1 no return 2 years.			

Of 32 surgical cases in which the end-result is known up to the present time, 20 are better, or have had recurrence and are now well.

4 cases	2 to 3 years.	4 cases . . .	6 to 7 years.
3 "	3 " 4 "	2 " . . .	7 " 8 "
2 "	4 " 5 "	3 " . . .	8 " 9 "
1 case	5 " 6 "	1 case . . .	9 " 10 "

Of 25 cases treated on the medical side, 68 per cent. have died, 32 per cent. are now well or have had no return of symptoms or have had a recurrence and are now well (1 case).

Of 32 surgical cases in which the end-result is known, 37.5 per cent. have died, 62.5 per cent. are better, well, or have had a recurrence and are now well.

Recurrence. In 2 patients recurrence has occurred, but both are now well.

Character of Fluid, with a View to Prognosis. In 4 cases in this series in which pus was present, 1 died of fecal fistula, 1 had a fecal fistula and recovered two and one-half years; 1 a persistent sinus, now better two years; 1 local sepsis, well two years. In 4 cases which have been heard from in which the fluid was bloody or slightly bloody, 1 died in a few months; 2 well six years; 1 well nine years. One case heard from in whom the fluid was turbid has been well two years. In 14 cases heard from in which the fluid was clear, 9 are dead; 4 are well; 1 is better.

Absence of Fluid. In 7 cases heard from without fluid, 1 has died, 6 are well.

Masses. In 19 cases with masses heard from, 12 have died, 7 have recovered, or a mortality of 37 per cent. In 30 cases with ascites without masses, 12 have recovered, 18 have died, or a mortality of 60 per cent.

Treatment. The treatment on the medical side was in the main symptomatic and hygienic. Tapping was resorted to whenever necessary

for the comfort of the patient. The treatment on the surgical side consisted of simple abdominal incision, sponging or washing out of the abdominal cavity with normal salt solution or sterile water, and removal of masses of tubercular material when possible. In 8 cases one or both tubes were removed at the time of operation; 32 of these cases were sewed up tight, 20 were drained with gauze or tubing. The pathological report is stated as tuberculous in 26.

Of those cases with ascites treated medically and tapped, the record is complete in 10, 7 were discharged dead or have died since discharge, 1 is well after an interval of eleven years, 1 has no return at five years, 1 no return in two years and three months.

Of especial interest in those cases which were tapped are the following: A woman, aged fifty years, entered the Massachusetts General Hospital in 1894 with tuberculosis of the peritoneum and glandular tuberculosis. There was marked ascites. She was tapped and discharged relieved. She re-entered one year and six months later, saying her health had been excellent since leaving the hospital. She had, however, lost flesh and color. Two months after leaving the hospital her abdomen was again tapped and nine quarts of serum withdrawn. In the preceding eight months before her re-entrance the abdominal swelling had increased so that she had to give up work. At re-entrance her abdomen was very much distended and fourteen and three-quarter quarts of fluid were withdrawn. Specific gravity, 1022; albumin, 3.4 per cent. She was discharged relieved, but died in 1898, four years after her first entrance.

A farmer, aged nineteen years, single, entered the hospital in September, 1889. One year previous glands of neck had suppurated, one abscess opened (a few months after recovery from mumps). With this there was some bronchial trouble from which he recovered. Two weeks before entrance he took cold, had a headache, backache, soreness in lower part of the abdomen. At entrance there was some ascites, which disappeared after one week. Three weeks after entrance one of the glands of the neck opened. He was transferred to the medical side, and three days after transfer the record states: "Encysted fluid in abdomen, some fluid in right pleural cavity, questionable right apex." He was kept out-of-doors daily, and January 4, 1890, the gland had nearly stopped discharging, the fluid had disappeard from the chest, there was still a little ascites. He was discharged on the above date, having shown steady improvement. He re-entered November 3, 1890. Except for a touch of "la grippe" had been improving. The abdomen had remained about the same, there was slight suppuration from one gland of the neck. Other scars had closed. There was some ascites present, and he was tapped November 8, 1890. Three and one-half quarts of slightly bloody fluid, with specific gravity

1017, and with much albumin, were removed. He was discharged November 20th, doing well. He reported December 20, 1890, looking much better. There was some resistance in the right flank. On March 8, 1891, "Feels as well as ever." Reported October 14, 1891, said that he had caries of rib which had been tapped, drained, and later curetted. This was now nearly healed. Weight, 134¾ pounds. Had been doing light work on a farm and had never felt better in his life. October 19, 1892, "never better, no symptoms, no cough," weight 140 pounds. May 16, 1896, rides a bicycle ten to twenty miles a day, no cough, feels well. November, 1901, reported excellent health.

Of those cases treated medically in which there were abdominal masses the record is complete in 6, as 3 have died, 1 had no return, and 2 are in good health. Of this number the following case is of interest:

A woman, aged twenty-six years, with abdominal pain of eight months' duration, with masses in the right hypochondrium, who gave a reaction to tuberculin, was discharged unrelieved after a two weeks' stay in the hospital. She was told of her condition and advised to live out-of-doors as much as possible. She went immediately to the seashore, where she says she had plenty of fresh air and good food. She rested for one entire year. Since that time she has been working constantly and considers her condition to be excellent. It is at present six years since discharge..

It has seemed well to record the ill results of operation. Fecal fistula occurred 6 times; 2 died in hospital; 1 recovered; 3 not heard from since discharge.

Local Abscess. Three cases: 1 died in hospital after second operation; 2 not heard from.

Shock of Operation. Two patients died within twenty-four hours.

Local Sepsis. Two cases: 1 died in three months; 1 recovered. In 2 cases sinuses persisted, ultimate recovery two years and four months, respectively. One case died four months, "decayed bowels." Two died, return of disease, four years and two months, respectively. There was 1 case of phlebitis and 1 case of hernia in the scar of operation. In 2 cases on the medical side the intestines were punctured during tapping; 1 with no ill result; 1 with development of fecal fistula.

Conclusions. The mortality when based on the condition of the patients at discharge, in a series of 98 cases of tubercular peritonitis at the Massachusetts General Hospital, is 13.2 per cent. The mortality of the same series of cases after a period of from two to eleven years is, on the contrary, 47.3 per cent. The ultimate mortality of patients in this series under medical treatment is 68 per cent.; under surgical treatment 37.5 per cent.; 2 patients have had recurrence, but are now well. None of the other patients at present report themselves as suffering from the disease.

In conclusion, I must confess that I am somewhat disappointed by not getting as definite indications from this series of cases as I had hoped for.

Recognizing that the number of cases is not large and that in many of those reporting themselves as now well, the lapse of time is, after all, relatively short, I am disposed to state the main therapeutic lessons which I derive from the analysis as follows:

1. Tubercular peritonitis may be followed by apparently complete recovery, even if complicated by tuberculosis elsewhere either under (*a*) purely medical treatment; (*b*) tapping; (*c*) incision.

2. As in other forms of internal tuberculosis, the best obtainable hygienic surroundings are all important. Consequently no patient should be kept in the hospital longer than is necessary, especially if more and better air can be secured outside with proper care and food.

3. We are warranted in trying medical treatment for a time, especially under first-rate hygienic conditions, tapping the abdomen if there is sufficient fluid to cause discomfort.

4. If the patient under a month or six weeks of medical treatment fails to improve, or in even less time if he seems to be losing ground, surgical treatment should be advised.

PNEUMOCOCCIC ARTHRITIS.[1]

By James B. Herrick, M.D.,
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It is a well-known fact that the diplococcus of Fraenkel is not limited, as to its habitat, to the lungs, nor, as to its effects, to the production of acute croupous pneumonia. In many of the inflammations that complicate pneumonia bacteriological examination has revealed the same pneumococcus that induced the primary pulmonary lesion, the mode of transport from the lung to the more distant organ being made clear by the detection of the micro-organisms in the blood during life or after death. It has also been shown that pneumococcic infection with primary localization other than pulmonary may occur, *e. g.*, in the middle ear, the meninges, the valves of the heart, the joints, etc. These facts are so generally recognized as true that they need no further comment, established as they are by numerous clinical, post-mortem, and experimental observations. Weichselbaum's[1] statement, made in 1888, has been repeatedly confirmed: "The diplococcus pneumoniæ can cause not alone pneumonia, but also various other processes, either at the same time as pneumonia or entirely independent of it."

[1] Read at the meeting of the Association of American Physicians at Washington, April 29, 1902.

There is scarcely an organ or tissue of the body that has not been mentioned as occasionally attacked by the pneumococcus either primarily or secondarily. These secondary localizations are commonly seen during or following a croupous pneumonia. Thus are recorded cases of pneumococcic tonsillitis, stomatitis, lymphadenitis, ulcerative gastritis, enteritis, peritonitis, encephalitis, meningitis, myelitis, otitis media, parotitis, cellulitis in various parts of the body, myositis, phlebitis, endocarditis, pericarditis, bronchitis, pleuritis, orchitis, ovaritis, metritis, nephritis, angiocholitis, conjunctivitis, keratitis, panophthalmitis, tenovaginitis, osteomyelitis, and arthritis. It is to the last-named pneumococcic inflammation—that of the joints—that attention is here directed.

The study of the subject is rendered easier by the fact that recently it has been very thoroughly gone into by Leroux,[2] whose monograph, with its collection of twenty-eight cases and its collocation of facts, must of necessity be freely drawn upon in the preparation of this article. In truth, Leroux's article makes such a paper as the present one seem much like repetition and almost unnecessary; but pneumococcic arthritis has received little notice in this country, and this paper may serve to call the attention of American physicians more forcibly to this subject, and it will add a few hitherto unrecorded cases to the list of Leroux and to that of Cave,[3] who has recently reviewed the topic in England.

Historical. Stray references to arthritis occurring during the course of pneumonia are found in periodical and text-book literature before the time of the recognition of the pneumococcus. Undoubtedly many cases passed as rheumatic or as pyæmic; but some observers clearly differentiated between the joint of ordinary rheumatism and this form of arthritis, with its frequent monarticular localization, its permanent rather than shifting character, the presence of fluid, and the absence of other ear-marks of rheumatism. No better illustration of such cases can be given than the ones cited by Leroux from Grisolle's *Traité de la Pneumonie*, 1864. I quote Cave's abstract: "Four patients, who had never suffered from any form of articular or muscular rheumatism, were attacked either early in the course of a pneumonia, or shortly after its subsidence, with acute arthritis, affecting in one case the two shoulders, in another the right knee, in the third the left ankle, and in the fourth the right wrist and the left knee. The last case was examined after death, and both the affected joints were distended by odorless pus, and the synovial fringes were injected. The joint affection was always a continuous one, with none of the fugitive character of true rheumatism; and after discussing the relations with this latter disease Grisolle came to the conclusion that the nature of the two affections was quite distinct."

Between 1883 and 1888 the pneumococcus was proven to be the cause

of croupous pneumonia, and it was discovered also that inflammation of structures other than the lung could be produced by this organism. In 1888 Weichselbaum reviewed the whole subject of the rarer localizations of the pneumonic virus, and described the case that, with Leroux, we must look upon as the first one clearly worked out in its details, and indisputably a pneumococcic arthritis. Since that time several cases have been recorded, so that, while a relatively rare complication, there were found by Vogelius, in 1896, 11 cases; by Leroux, in 1899, 28 cases; and by Cave, in 1901, 3 more, making a total of 31 cases. To this number I am able to add 9 cases that have been seen in Chicago—1 by Billings, 1 by Billings and Preble, 1 by Preble, 1 by Hektoen, 1 by Quine, 1 by E. F. Wells, and 3 by myself. Raw reports 7 cases from England as seen by himself. Allen and Lull report an interesting primary pneumococcic arthritis of the knee. I have been able to find a few cases also that had escaped the notice of Leroux and Cave. My attention was called to 2 of these by Dr. E. F. Wells, who kindly gave me the references. Altogether I add to Cave's list 21 cases, making a total of 52. In all of these bacteriological examination has proven the presence of the pneumococcus in the joint. Two other cases I have seen where there is no reasonable doubt as to the nature of the joint affection; but as these cases lack bacteriological confirmation I am forced to omit them from the series, as also 3 others—2 of Preble's and 1 of Bernheim's.

FREQUENCY. Pneumococcic arthritis is a relatively rare affection. Cave found no recorded observations in England before his, though, of course, cases had previously occurred, but had not been recognized. In running through a number of German inaugural dissertations, most of them statistical studies on pneumonia, I find the following figures:

Name of reporter.	Hospital.	Year.	No. of cases of pneumonia.	No. of cases of arthritis.
Sello,	Urban Hospital, Berlin,	1890–1897	750	One case, right shoulder.
Moosberger,	Zürich (Eichhorst),	1884–1890	359	No case mentioned.
Samter,	Breslau,	1881	331	No case mentioned.
Herrmann,	Leipzig,	1893	235	One case with serous gonitis ("gelenk rheumatismus?").
Fricke,	Göttingen,	1886	169	No case.
Pöhlmann,	Erlangen (Strümpell)	1886–1888	239	No case.
Morhart,	Erlangen (Strümpell)	1888–1892	209	No case.
			2292	2 cases of arthritis.

Vogelius cites the figures of the Charité, in Berlin, for 1874–1889, 3293 pneumonias, with 2 cases of arthritis; Munich, for eleven years,

650 pneumonias, 1 arthritis; several clinics in Paris, 1215 cases of pneumonia, 3 of arthritis.

Netter finds figures of 4156 cases of pneumonia reported from German clinics, with but 6 cases of arthritis. In Allbutt's *System* no mention is made of arthritis as a complication of pneumonia, nor does Aufrecht, in Nothnagel's *System*, refer to it.

These figures and the experience of physicians in general practice bear out the statement that the complication is quite rare, being found once in perhaps 800 cases; yet, like many other affections, when one is on the lookout for it, it will less easily escape detection, and it will probably be found that its frequency is greater than these statistics would show.

Raw found it in 1 per cent. of his cases. Its frequency in Chicago might excite comment; but most of the Chicago cases referred to in this article were seen in the Cook County Hospital, where many of our pneumonics are also alcoholics—a condition recognized as favoring the occurrence of arthritis, and referred to by Raw as helping to explain his high percentage. We have also in the last few years had a great deal of pneumonia in Chicago of a severe type and presenting atypical and complicated forms; and, as I have said, when one is on the lookout for these things they do not escape notice as they otherwise might.

The following is made up of Cave's table (the first 31 cases), with the additional cases which I am able to add. The first 28 cases are those collected by Leroux. For the sake of completeness I have copied this table entire, and have added the other cases, as Raw has done, with the same order of tabulation of facts as adopted by Cave. The references to the literature of the first 31 cases will be found in Leroux's and Cave's article. I give references, therefore, only for the cases which I have added.

In 47 cases there were 40 males and 7 females. The greater frequency in the male sex may perhaps have a partial explanation in the fact that pneumonia is more frequently seen in males, at least in hospital practice, and that a larger proportion of males would present the favoring influence of previous alcoholism, plumbism, and traumatism, which factors to a certain extent seem to determine the localization of the pneumococcus in the joint. Adding my figures to those of Cave, we have the following facts concerning the age and also the joints most commonly affected. Before ten years, 4 cases; from ten to twenty years, no cases; from twenty to thirty years, 5 cases; from thirty to forty years, 9 cases; from forty to fifty years, 15 cases; from fifty to sixty years, 11 cases; from sixty to seventy years, 4 cases; from seventy to eighty years, 2 cases.

TABLE OF CASES OF PNEUMOCOCCIC ARTHRITIS.

No.	Observer.	Date, sex, age.	Relation to pneumonia.	Seat of arthritis	Nature.	Complications and remarks.	Result.
1	Weichselbaum,	1888 ? 54	Pneumonia, 3 days before.	Right shoulder	Suppurative.	.....	D.
2	Belfanti,	1889 ?	Pneumonia, 11 days before.	Right wrist.	"	.....	D.
3	Monti,	1889 ?	Pneumonia.	Metacarpo-phalangeal.	(?)	.....	D.
4	Ortman and Samter,	1890? M. 34	Pneumonia, few dys. before.	Shoulder.	Suppurative.	Arthrotomy.	R.
5	Macaigne and Chipault,	1891 F. 60	Pneumonia, 4 days before.	Right knee.	"	"	R.
6	Chantemesse,	1891 adult	Pneumonia, crisis 2 d. before	Elbow; knee.	Serous.	Meningitis.	D.
7	Boulloche,	1891 M. 5	Pneumonia, 3 days after.	Knee; both elbows.	Suppurative.	.....	D.
8	Picqué and Veillon,	1891 M. 36	Pneumonia, 4 days before.	Right knee.	"	Arthrotomy.	D.
9	Brunner,	1892 M. 52	Pneumonia, 2 days before.	Left wrist.	"	"	D.
10	Juvigny,	1894 M. 52	Pneumonia.	Both knees; ankle.	"	"	D.
11	Dominici,	1896 M. 44	Pneumonia, 12 days before.	Right shoulder	"	Peri- and endocarditis; meningitis; lead.	D.
12	Griffon,	1896 F. 71	None.	Right ankle.	"	Endocarditis; meningitis; arthrotomy.	D.
13	Mercantonio,	1896 M. 71	Pneumonia, some dys. before	Right shoulder	"	Arthrotomy.	D.
14	Oliva,	1896 M. 8	Pneumonia, 7 days after.	Arms and feet (multiple).	Serous.	Pneumococcus found in sputa only.	R.
15	Vogelius,	1896 M. 38	Pneumonia, 5 days before.	Right sterno-clavicular.	Suppurative.	Arthrotomy.	R.
16	Vogelius,	1896 M. 60	Pneumonia, some dys. before	Hip.	"	Endocarditis; empyema; lead; arthrotomy.	D.
17	Schabab,	1896 M. 45	Pneumonia.	Left hip and knee.	"	.....	D.
18	Ausset,	1896 M. 41	Pneumonia, 7 days before.	Both knees.	"	Rheumatism two years before.	D.
19	Fernet and Lorraine,	1895 M. 56	Pneumonia.	L. sterno-clavicular; r. shoulder (recover'd).	"	Endocarditis; meningitis. The arthritis of shoulder subsided before death.	D.
20	Widal and Meslay,	1896 M.ad.	None.	Left first metatarso-phalang'l	"	Purulent pericarditis; lead.	D.
21	Duflocq and Ledamany,	1896 M. 32	Pneumonia, 9 days before.	Both elbows; left shoulder; right knee.	"	Old rheumatic arthritis.	D.
22	Tournier and Courmont.	1896 M. 50	Pneumonia, 6 days before.	Left knee and shoulder.	Serous.	Empyema; secondary syphilis.	D.
23	Widal and Mercier,	1897 M. 46	Pneumonia, 4 days before.	Multiple, wrist and ankle.	Suppurative.	Endocarditis; typhoid arthritis 25 years before.	D.
24	Galliard and Morèly,	1898 M. 44	Pneumonia, 9 days before.	Right wrist.	" "	Stiffness and grating of joint; arthrotomy.	R.
25	Widal and Lesné,	1898 M. 68	None.	Left sterno-clavicular; left wrist.	" (?)	Old chronic rheumatism of small joints of hands and feet.	R.
26	Petit,	1898 M. 42	Pneumonia, 5 days before.	Left knee.	Suppurative.	Meningitis; arthrotomy.	D.
27	Sorel,	1898 M. 48	Pneumonia, 8 days before.	Left shoulder.	"	Empyema.	D.
28	Leroux,	1899 M. 45	Pneumonia, 9 days before.	Left wrist.	"	Endocarditis; pleurisy; peritonitis; meningitis.	D.
29	Fernet and Lacapère,	1900 M. 47	Pneumonia, 3 or 4 dys. before	Right wrist.	Serous.	Joint stiff.	R.
30	Rendu,	1900 M. 66	Pneumonia, 15 days before.	L. sterno clavicular; l. knee.	Suppurative.	Arthrotomy.	R.
31	Cave,	1900 M. 51	Pneumonia, 9 days before.	Left shoulder.	Serous.	.....	D.
32	Nicolaysen,	1896 M. 3 wks	10 dys. from onset of sympt'ms of infectious disease involving bronchi and lungs.	Right elbow.	Suppurative.	Double empyema; suppurative pericarditis; bronchitis; no operation.	R.
33	Mühsam,	1897 M. 55	Entered surg. ward 24 days after onset of pneumonia.	Right shoulder	"	Incision and drainage; desperate case; regarded as hopeless at time of operation; alcoholic.	R.

No.	Observer.	Date, sex, age.	Relation to pneumonia.	Seat of arthritis	Nature.	Complications and remarks.	Result.
34	Heubner,	1897 5 mos.	At least 3 wks. after onset of pneumonia; several days after normal temperature.	Left shoulder.	Suppurative.	Incision and drainage.	R.
35	Flament,	1898 M. 55	.....	Knee.	"	Resection.	R.
36	Raw,	1898 M 28	Pneumonia, 3 days before.	Right sterno-clavicular joint	"	Free incision and drainage; right otitis media and abscess of thigh.	R.
37	Raw,	1899 M. 52	Pneumonia, 2 days after.	Right ankle, right sterno-clavicular.	"	Incision, arthrotomy, stiff joint, right empyema.	R.
38	Raw,	1900 F. 49	Pneumonia, 2 days before.	Right shoulder	"	Incision, drainage, arthrotomy, septicæmia.	D
39	Raw,	1897 M. 23	Pneumonia, 2 days before.	Right knee.	Serous.	Aspiration.	R.
40	Raw,	1898 M. 51	Pneumonia, 2 days before.	Both knees.	"	General treatment; alcoholism; a severe infection and toxæmia.	D.
41	Raw,	1900 M. 58	Pneumonia, 3 days before.	Right knee.	Suppurative.	Incision and drainage; stiff, though fairly useful joint.	R.
42	Raw,	1901 M. 42	Pneumonia, about same time.	Right shoulder	"	General treatment; severe general infection, with extensive cellulitis of shoulder.	D.
43	Billings and Preble,	1899 F. 43	Pneumococcic septicæmia; no lung involvm't; pneumococcus from blood, joints, and by lumbar punct.	Elbow, wrist, ankle, knee.	"	Pneumococcic septicæmia with localization in pericardium, meninges and joints. Autopsy.	D.
44	Preble,	1899 M. 33	Exact date of arthritis uncertain, but joints swollen at time of first observ. 14 days from initial chill of pneumonia.	Right foot; left knee, elbow, wrist, and second metacarpo-phalangeal joints.	"	Pneumococci from blood during life.	D.
45	Billings,	1900 M. 23	16 days after chill of pneumonia.	Rt. shoulder, lt. knee, lt. metatarso-phalangeal joint of great toe.	"	Meningitis; distinct trauma to joints.	D.
46	Hektoen,	1901 M. 47	.....	Left knee.	"	Pneumococcus in heart's blood at autopsy.	D.
47	Allen and Lull,	1901 F. 40	Primary in joint; no pneumonia, no pneumococcus in the blood.	Left knee.	"	Arthrotomy, and later amputation.	D.
48	Quine,	1902 F. 30	7 days from onset of an angina and 5 from beginning of pneumonia.	Right sterno-clavicular.	"	Incision; endocarditis, nephritis, probable pericarditis.	D.
49	Wells,	1902 F. 32	2 days after crisis of pneumonia.	Left sterno-clavicular.	"	Incision and drainage.	R.
50	Herrick,	1902 M. 32	7th day of pneumonia immediately following crisis	Left elbow.	"	Aspiration; useful and movable joint.	R.
51	Herrick,	1902 M. 41	15 days from beginning of pneumonia.	Left hip and knee.	Knee, serous; hip, unknown.	Plumber, alcoholic; previous injury of hip and knee; aspiration of knee; useful joint; hip not treated; ankylosis.	R.
52	Herrick,	1902 M. 26	12 days after crisis of pneumonia.	Left knee.?	Suppurative.	Incision and drainage; severe toxæmic symptoms; pericarditis.	D.

In 23 of the 52 cases the upper extremities alone were involved; in 18 cases the joints of the lower extremities alone; in 11 there was involvement of joints of both the upper and lower extremities. These figures show a slight preponderance in favor of limitation to the upper extremity, but so slight that little or no significance can be attached to it. In fact, the knee seems to be the joint oftenest affected, being involved in 22 of the 52 cases, in 3 of which both knees were affected, so that out of a total of 84 joints the knee makes up 25, or about 30 per cent. The involvement of other joints was as follows: the sternoclavicular, 8 times; the shoulder, 12 times; the elbow, 9 times; the wrist, 8 times; the metacarpophalangeal twice; the hip, 3 times; the knee, 25 times; the ankle, 3 times; the metatarsophalangeal, 3 times. The arthritis was monarticular in 32 instances, or in 61.5 per cent. of the cases. The joints thus solitarily involved were: shoulder, 10 times; knee, 9 times; wrist, 5 times; elbow, twice; sternoclavicular, 4 times; and the hip, ankle, metacarpophalangeal, and metatarsophalangeal each once. Of the remaining cases there were involved two joints, 9 times; three joints, 4 times; four joints, once; more than four, 3 times. These figures bring out the fact that the larger joints—the knee, shoulder, elbow, and wrist—are more often affected than the smaller, though it is to be noted that one of the smaller joints—the sternoclavicular—was inflamed 8 times; oftener, it will be seen, than the hip, which was involved but 3 times.

The influence of trauma in bringing about this form of arthritis has been noted by many writers upon the subject. Five of the number had distinct histories of injury of the joint affected, by sprain or bruise either shortly before or during the course of the pneumonia. One of my patients—Case LI.—four weeks before the onset of the pneumonia had fallen through a trap-door, sprained the knee, which later became infected, and had been for several days confined to the bed on that account. In this connection the case of Billings—Case XLV.—is interesting and instructive. In both these cases the influence of trauma in inducing localization in a given joint seems clear; and, again, it is seen how the arthritis is prone to occur during convalescence.

This production of a locus minoris resistentiæ in the joint by traumatism, thus favoring the localization of the pneumococcus, is in accord with experimental work along this line, dealing not only with this microbe but others, and in connection with such conditions as osteomyelitis, endocarditis, etc. The experimental work in connection with pneumococcic arthritis shows that injection of the pneumococcus directly into the joint, or injection into a vein, the joint being at the same time injured, frequently results in suppurative arthritis. Subcutaneous injection under similar conditions less frequently results in arthritis. The work of Bezançon and Griffon will be referred to later.

In some cases, too, there has been a history of previous damage to the joints by rheumatism. Lead-poisoning was present in two cases, and in one of these uratic crystals were found in the cartilage of the joint inflamed through the pneumococcus, constituting the point d'appel of Netter. One of my patients was a plumber, though I could not make out any evidence of chronic lead-poisoning; and the man in whom Dr. Hektoen found at autopsy a pneumococcic arthritis of the knee was a painter. Of the influence of the damage to the joint by a mechanical trauma there can be little doubt. Whether previous rheumatism, gout, syphilis, and lead-poisoning also act in this way is less easy of proof, though it would seem to act as a favoring cause in some cases. The possible influence of chronic alcoholism, nephritis, and previous disease in lessening the resisting power of the patient should not be overlooked. In several instances the patients were alcoholics and the pneumonia of the alcoholic type.

For the sake of completeness I give brief abstracts of the cases that I have added to Cave's list.

CASE XXXII. (Nicolaysen).[6]—A boy, aged three weeks, was taken, July 30th, with fever, cough, and rapid respiration. August 9th he cried all night as with pain, and his right elbow was found red and tender, the swelling, later, extending down over the forearm. Death occurred a few days later, and the autopsy revealed a double empyema, suppurative pericarditis, bronchitis, and suppurative arthritis of the right elbow. The pneumococcus was found in the blood during life, and after death was found in the pus in the pleuræ and in the joint.

CASE XXXIII. (Mühsam).[7]—A laboring man, aged fifty-five years, alcoholic, was taken, August 2, 1897, with pneumonia of the right lower lobe. August 31st the right shoulder-joint was opened, and 200 c.c. of thin fluid pus containing the pneumococcus were removed. The joint was much disintegrated. Notwithstanding the serious and seemingly hopeless condition of the patient at the time of operation he made a slow yet permanent recovery.

CASE XXXIV. (Heubner).[8]—A child, aged five months, after a bronchitis and a pneumonia of the upper lobe of the right lung, improved but slowly. No fluid was found on exploratory puncture of the still dull upper lobe. Four weeks from the beginning of the illness the left shoulder became suddenly inflamed, with a rise in temperature. Pus containing the pneumococcus was obtained on free incision. The child recovered.

CASE XXXV. (Flament).[9]—Flament reported to the Medical Society of Lille, at its meeting of June 22, 1898, the case of a man, aged fifty-five years, who had a suppurative inflammation of the knee following a pneumonia. The pneumococcus was found in the pus. Under resection the patient recovered.

The next 7 cases are those of Raw.[10] I quote his abstracts verbatim:

CASE XXXVI. (Raw).—H. G., aged twenty-eight years, was admitted into Mill Road Infirmary with acute pneumonia of the right lung. The whole lung was involved, and the attack was a very severe one, with

considerable pleurisy. He had his crisis on the eighth day, and was apparently doing well, when, on the eleventh day of his illness, he had a rigor, and was seized with intense pain in the right ear, accompanied by a sudden rise of temperature. Next day a swelling appeared over the second right costal cartilage, with great pain and tenderness. Two days afterward a large abscess rapidly formed over the right buttock. His condition became very critical, and his temperature high and erratic. An incision was made over the swelling on the chest, and was found to be an abscess of the right sternoclavicular joint pointing between the first and second ribs; the abscess of the buttock was drained, giving exit to a large quantity of sweet-smelling pus. The abscess in the middle ear burst the same day, giving great relief. Very careful precautions were taken in examining microscopically and bacteriologically the pus from every source above described, as well as the sputum.

In all cases apparently the same organism, the pneumococcus of Fraenkel, was found in pure culture. The man made a good recovery, and is well to this day. I have no doubt that in this case prompt surgical interference saved his life.

Case XXXVII. (Raw).—T. A., aged fifty-two years, was admitted on January 5, 1900, with severe pain in right side of chest, and profuse, dark expectoration. He had also pain and swelling of right ankle and swelling, with great tenderness, over the right sternoclavicular joint. Next day he was found to have definite pneumonia at the right apex, with effusion at the base.

The joints seem to have swollen before the onset of his pneumonia, and he had suffered from rheumatism on several occasions. As soon as the pus was found in the joints they were freely incised and drained, both articulations being found roughened and bare. The pneumonia ran an ordinary course and his temperature fell, but later he developed an empyema which was also opened and drained. This man had a most severe general infection by pneumococci, and although repeated cultures were made from the pus and sputum no other pathogenic organisms were found except diplococci. After a long illness he made an excellent recovery, his chest quite healed, as also the sternoclavicular joint; the ankle healed up, but the joint remained stiff.

Case XXXVIII. (Raw).—K. F., aged forty-nine years, charwoman, admitted June 11, 1900, with severe pain in right chest and abdomen, with all the symptoms of acute pneumonia. She was an alcoholic, and had a severe struggle until the crisis, which occurred on the seventh day. Two days after this a swelling appeared under the right deltoid muscle, with great pain on movement. A needle was inserted into the joint and pus withdrawn. I freely incised the joint, and let out eighteen ounces of curdy, sweet-smelling pus. I noticed at the operation there was considerable infiltration between the muscles around the joint. Her temperature dropped and she appeared to be doing well for twelve days, when she developed empyema of the right side. This was opened and drained; then a large abscess developed in the abdominal wall, which was drained, but the patient sank into a condition of general pyæmia, and died on the twenty-eighth day. Pneumococci in pure culture were obtained in all the samples of pus and sputum.

Case XXXIX. (Raw).—A man, aged twenty-three years, was admitted with an ordinary attack of acute lobar pneumonia of the right

lung. His crisis occurred on the seventh day. Two days afterward he developed a painless swelling of the right knee, with a temperature of 100° F.; a needle drew off clear serous fluid. Under the microscope, however, pneumococci were found in abundance. The joint was aspirated of seven ounces of fluid and firmly strapped. After a slow and tedious convalescence he eventually recovered and walked out with a useful joint.

CASE XL. (Raw).—A man, aged forty-three years, a confirmed alcoholic, was admitted in a collapsed condition with acute lobar pneumonia of the right lung. Two days after admission, being the sixth day of the disease, he developed a painless swelling of both knees. A needle showed serofibrinous effusion which, on cultivation and examination, was found to be a pure culture of pneumococci. He died on the following day, and at the post-mortem examination he was found to have a most severe pneumonia, with inflammation of both knee-joints. The organisms recovered from the lung and the knee-joints appeared to be identical.

CASE XLI. (Raw).—A man, aged fifty-eight years, also a drunkard, was admitted on April 13, 1900, with acute pneumonia of the right lung. He had his crisis on the seventh day, and appeared to be comfortable, when he was seized with great pain in the right knee and rapid distention of the joint. A needle showed sero-pus, which on being stained revealed pneumococci with well-defined capsules. Dr. Pitt-Taylor opened and drained the joint, which continued to discharge pus for two weeks and eventually healed, leaving the man a very useful joint. He was discharged, recovered, but his knee was fairly stiff, although not in any way ankylosed.

CASE XLII. (Raw).—F. D., aged forty-two years, tram driver, was admitted on July 12, 1901, with acute pneumonia of the right lung. On admission he complained of great pain in his right shoulder, which was dusky-red and inflamed, but without any definite fluctuation. He died before any operation could be performed, and careful examinations of the fluid from the shoulder showed pure culture of pneumococci. In this case, also, an extensive intramuscular infiltration was found around the shoulder-joint.

CASE XLIII. (Billings and Preble).[11]—A seamstress, aged forty-three years, was taken with chills and became so delirious that she was removed to the Detention Hospital. She was sent a few hours later to the Cook County Hospital, where it was found that she had, in addition to the fever and delirium, a choked disk, a rigid neck and unequal pupils. In the pus obtained by lumbar puncture the diplococcus of pneumonia was found. It was extracellular. The elbow, wrist, knee, and ankle were swollen, red, tender, and painful. From the left wrist a few drops of thick, whitish muco-pus were obtained, showing the pneumococcus; the blood also revealed the same organism. Pericarditis was recognized.

The autopsy (Hektoen) showed pneumococci in the blood, with suppurative inflammation of the meninges of the brain and cord, of the joints, and of the pericardium. The pneumococcus was recovered from each of these locations. There was no involvement of the lung in pneumonia.

CASE XLIV. (Preble).[12]—A male, aged thirty-three years, early in January, 1899, had la grippe. January 23d he had a chill, followed

by pain in both sides of the chest, as well as in the right shoulder and all the joints of the left arm. When he came under Dr. Preble's observation he had the evidences of consolidation of the left lower lobe, fluid in the right chest, with some pleural friction. The joints of the right foot, left knee, elbow, wrist and second metacarpophalangeal joint were red, swollen, painful, and tender. Smears and cultures from the left wrist and from the blood showed only the pneumococcus. Death. No autopsy.

Case XLVI. (Billings).[13]—A male, aged twenty-three years, non-alcoholic, who had several years before suffered from pneumonia and also from rheumatism, was taken ill with severe chill, pain in the left chest, followed by fever, cough, yellowish expectoration changing to rusty. After six days he entered the hospital, where was found a consolidation of a portion of the left upper lobe, the process migrating until the entire left lung became involved. The breathing was rapid, the temperature high, reaching normal by lysis on the ninth day after admission to the hospital and the fifteenth from the onset of symptoms. On this day the patient's mind was clear and he appeared convalescent. Previous to this he had been delirious, and while in this state had jumped from the second-story window to the ground, a distance of twelve or fifteen feet. No bones had been broken, but the right shoulder and left knee were injured. On the day after the temperature reached normal the patient complained of great pain in the right shoulder and the left knee, and the latter was swollen and tender, and fluctuated. The metatarsophalangeal joint of the left great toe was also swollen and tender. Symptoms of meningitis now appeared, and three days later, on the thirteenth day of his stay in the hospital, or the nineteenth from the initial chill, he died. No autopsy. A few hours before death the left knee, right shoulder and spinal subarachnoid space were punctured, each yielding a turbid, purulent-looking fluid that coagulated spontaneously. The fluid from each of these places contained an encapsulated diplococcus that stained by Gram. In cultures the growth was typical of the Fraenkel diplococcus.

Case XLVII. (Hektoen, personal communication).—The clinical history is lacking. The patient was a male, aged forty-seven years, by occupation a painter. The anatomical findings showed a lobar pneumonia of the upper and lower lobes of the right lung, acute bronchitis of the left lung, and a purulent synovitis of the left knee-joint. This joint contained a large quantity of thick, creamy pus. The synovial membrane was swollen and reddened, but there were no erosions in any part of the joint. The right knee-joint was normal; smears from the lung, the heart's blood, and the pus in the joints revealed a diplococcus staining by Gram. Cultures from the pus gave a diplococcus staining by Gram and identified as the diplococcus of pneumonia.

Case XLVII. (Allen and Lull).[14]—A woman, aged forty years, was taken with cramps in the abdomen and pain in the left knee. Rheumatism and then gonorrhœa were suspected. No further facts as to her history were obtainable. The urine was negative. The leucocytes, 27,000. On the fifth day the joint was distended, tense, and very painful. The temperature varied from normal to 101° F. The joint was freely opened, irrigated and packed, thick yellowish pus containing only the pneumococcus being evacuated. The temperature rose, and the next day the patient was delirious. An amputation was made in

the lower thigh, well away from the joint and through apparently healthy tissue. There was some temporary improvement, then pus appeared in the wound; there were leucocytosis, chills, and death, with a temperature of 108.2° F. Death occurred seventeen days after the first symptom.

Autopsy (Dr. W. T. Howard) showed the pneumococcus and the staphylococcus pyogenes aureus in the amputation stump, with interstitial myositis and suppuration. No germs were found in the blood or in the heart, lung, liver, spleen, or kidneys. Death, therefore, seemed to be due to toxæmia, and the primary joint infection had arisen through some unrecognized portal of entry of the pneumococcus.

Case XLVIII. (Dr. William E. Quine, personal communication).—The patient was an anæmic, overworked young woman of exemplary habits. Early in February, 1901, she was ill with rheumatism, which had nearly disappeared, when, on March 5th, she had a hard chill, high fever, and a severe sore-throat resembling a phlegmonous inflammation. No pus was found on puncturing the tonsil, but a nearly pure culture of the pneumococcus was obtained from the throat. Other chills followed, and signs of pneumonia of the lower lobe of the right lung appeared, with evidence of an acute endocarditis. There was a suspicion also of a pericarditis. The urine contained albumin, casts, and a microscopical quantity of blood. March 12th the patient was in a nearly moribund condition. A swelling was at this time noticed over the right sternoclavicular articulation. How long it had been forming is not known. Two drachms of thick pus were evacuated, which pus contained only the pneumococcus. The patient died a few hours later.

Case XLIX (Dr. E. F. Wells, personal communication).—A lady, aged thirty-two years, was taken, January 17, 1898, with a chill, followed by fever, pain, cough, expectoration, and all the ordinary symptoms and signs of pneumonia of the lower lobe of the right lung. The attack was one of moderate severity, with a temperature ascending to 104° F., respirations to 32, pulse to 124, and leucocytosis to 24,000. There was no delirium, but after the first three or four days there was noticeable pallor. On the sixth day there were, for several hours, pain and tenderness along the course of the left femoral vein. On the seventh day the temperature began to decline and reached the normal point on the following morning. The pulse, however, remained well above 100, and the patient felt weak and tired. On the morning of the ninth day the left shoulder was reported as sore and painful when moved. In the evening a small, tender swelling was discovered over the left sternoclavicular articulation, which, on the next day had increased to the size of a large hickory-nut, and was reddened and softened. This was incised, giving exit to about three drachms of greenish-yellow pus. The cavity was washed out with peroxide of hydrogen. A seropurulent discharge continued for three or four days, when it ceased and the wound closed, without further symptoms. The pus contained only pneumococci, which were stained by Gram's method. Cultures, also, showed only the pneumococcus. Recovery was perfect, but convalescence was unusually tedious. It is interesting to note that the pain was referred, indefinitely, to "the shoulder," although there was no evidence that this joint was affected.

Case L. (Herrick).—Thomas L., single, aged thirty-two years, laborer, came under my care in the Cook County Hospital, April 10,

1898. His mind was clear, and from him were obtained the following facts: There was no hereditary taint, though several brothers and sisters had died young, the exact cause of death being unknown. The patient had been a free user of beer and whiskey. He had had gonorrhœa and a soft chancre, though no fresh venereal disease for more than two years. He had regarded himself as in good health until four days before, when, after an ordinary "cold," he had a slight chill, began to cough more, and noticed pain in the right axilla. He at once quit work.

On examination the typical physical signs of consolidation of the upper and middle lobes of the right lung were found, the dulness and bronchial breathing, with a few fine moist râles, being accurately limited to this area. The heart and other organs revealed nothing abnormal except that the urine contained a moderate amount of albumin and a few hyaline casts. Its specific gravity was 1021. There was slight icterus. For three days the respiration was rapid, 36 to 50; the pulse varied between 96 and 144, and the temperature from 101° to 104.3° F. On the morning of the seventh day of the illness the temperature was 98° F., and from that time on there was a gradual improvement, though it was not until April 19th, the thirteenth day, that the evening temperature did not rise above 99° F. At this date the breathing was 30, pulse 84; the patient still quite weak. The treatment was by large doses of digitalis, after the method of Petrusco. April 14th, the seventh day of his illness and on the morning of which the temperature was 98° F., the following note is recorded: "Since morning the patient has been complaining of pain in the left elbow, and keeps the left arm quiet. The left elbow is swollen, reddened, tender to pressure, and extremely painful on motion. There is considerable œdema, especially over the external aspect of the joint. There has been no extension of the pneumonic process in the lungs. The heart tones are normal, though the action is rapid and the pulse is rather weak. The urine still contains some albumin." Hot boric-acid dressings were applied to the joint. April 20th there was slight fluctuation; and in the clinic, under aseptic precautions, I withdrew by means of an aspirating syringe about two drachms of a yellow, creamy pus. I withdrew all that I could. Smears were made at once, and showed a diplococcus morphologically like the diplococcus of pneumonia. Further examination of the pus by cultures showed the organism to be the diplococcus pneumonia. No other germs were found. Several specimens of sputum taken at different times during the course of the disease revealed abundant diplococci, but no tubercle bacilli. The joint showed immediate improvement after the aspiration, and from that time there was a gradual return to the normal condition of the elbow. When the patient left the hospital, May 16th, there was no redness or swelling, and but slight pain on firm pressure over the joint. The motion of the elbow was free. On the date of discharge the patient's lung had cleared up, and he was rapidly regaining his strength.

Case LI. (Herrick).—John H., white, aged forty-one years, married, a plumber by trade, enjoyed good health since childhood. He denied syphilis, and had had no sign of gonorrhœa since an attack ten years ago. He had never had any manifestation of lead-poisoning; had indulged rather freely in alcoholics. His father died of pneumonia; his mother and one sister of phthisis.

August 15, 1900, he fell through a trap-door and sprained his left knee, causing great pain and some swelling, and making him drag his leg for a few days. By September 1st he felt all right, and regarded himself as recovered. He then began drinking heavily, and suffered from vomiting, diarrhœa, and some pain on the inner side of the thigh. The history here is rather vague, as the patient was under the influence of liquor most of the time; but he remembers some pain in the thigh, some swelling of both legs, and the vomiting. He was kept in bed by a doctor for a time.

September 18th he began to cough, and had pain in the chest, with fever. He was sent to the Cook County Hospital, where he came under my care September 21st. He was nervous, sleepless, soon delirious, had a coarse tremor. There were dulness, bronchial breathing, and a pleural friction over the lower left chest. The heart was normal as to size and sounds, and was not displaced. The examination of the abdomen revealed nothing abnormal, as also did the examination of the genitalia and lymphatic glands. There was some œdema about either ankle. The urine contained a trace of albumin, but no casts. The temperature for a week ranged from 100° in the morning to 103° F. in the evening; the respirations rose to 40; the pulse averaged 130. The patient ran the course, for a week, of an alcoholic pneumonia, and was seriously ill. He became rapidly emaciated, and, the fever not disappearing by crisis, tuberculosis was suspected. Several examinations of the sputum failed to reveal tubercle bacilli, however, and the lung gradually cleared up. On September 27th a to-and-fro friction rub was heard over the præcordia, thought to be pericardial. It disappeared in twenty-four hours.

October 3d the pulse was 110, respiration 30, temperature 100° F., the lung clearing. On this day he complained of quite severe pain in the left hip and knee. He lay with the thigh partly flexed on the abdomen; no local swelling could be made out in either joint. This pain continued with varying intensity, and was relieved somewhat by hot fomentations and later by extension by a weight and pulley. No local redness, swelling, or œdema could at this time be made out in either the hip or the knee. The temperature remained for four weeks between 98° and 99.8° F.

By November 27th, after the extension had been discontinued for several days, and when the hip showed very limited motion, and this very painful, the left knee had become decidedly swollen and fluctuated. By aspiration 30 c.c. of slightly reddish, thin fluid were withdrawn. A second aspiration was made nine days later and 15 c.c. of a similar fluid withdrawn. The fluid from the joint contained in smears an encapsulated diplococcus staining by Gram, and in cultures was identified as the diplococcus pneumoniæ. The knee was bandaged tightly, and the patient left the hospital December 27, 1900, using a crutch.

In September, 1901, I sent for him to come to my office, and I found him in good general condition, with normal heart, lungs, and abdominal organs. The urine was non-albuminous. There was no blue line on the gums. The left knee was freely movable, and appeared normal in every respect except for a very slight tenderness. The left hip, however, was fixed, though painless. With every movement the pelvis was tilted, and a seeming shortening of the left limb was found by careful

measurement to be apparent rather than real, and due to a tilting of the pelvis. There was no patellar reflex on the left side; it was present on the right. The left thigh was smaller in circumference than the right by three inches; the left leg measured twelve inches, the right twelve and a half. The man walked with a cane, was free from pain, and was ready to do light work. The muscular atrophy and loss of the patellar reflex in the affected limb suggests the possibility of a simultaneous involvement of nerve and joint, or the nerve or the muscle may have been inflamed secondarily. In several autopsy records the muscle has been described as involved in the pneumococcic inflammation. Bezançon and Griffon make the statement that in their experimental work they were struck by the absence of muscular atrophy in the vicinity of the joint, a fact "not in accord with what has been observed in man." Further observations on this point would be interesting.

Case LII. (Herrick).—Walter F., aged twenty-six years; single. Family history negative. December 9, 1901, when in apparently good health, suffered from earache. That night he had a temperature of 103° F., and on the following day was told by his physician that he had pneumonia. There were no chills and no pain in the side. He coughed, but the sputum was scanty. The temperature ranged between 102° and 104° F. December 14th he became delirious, and the next day was brought to the Presbyterian Hospital, and from that time on was under my care.

He was a well-developed and well-nourished man of medium size; was quite delirious. Over the left lower lobe were dulness, bronchial breathing, and increased voice sounds as in croupous pneumonia. A pericardial friction rub, to and fro in character, was best heard in the right third interchondral space. The respiration for three days was between 40 and 50, the pulse 110 to 136, the temperature 102° to 104.6° F. The urine showed some albumin and a few hyaline and granular casts. On the evening of December 17th the temperature fell by crisis, and was practically normal for five days. During these five days the respiration was easy and regular, 28 to the minute, the pulse was never over 90, the mental condition was one of brightness, and the local signs were those of slow resolution.

December 25th he complained of earache, and that night his temperature rose; no new local changes could be made out in the lung, nor was anything abnormal discoverable on examination of the ear, Dr. W. T. Montgomery kindly making this examination for me. The patient's general condition became steadily worse, the mind becoming dull, the tongue dry, the pulse rapid and quick, even to 144, and the temperature never below 103° F., and often nearly 106° F.

The case looked like one of severe septicæmia. An examination of the blood, four drachms being taken from the right median basilic vein, showed no growth on agar plates. December 29th he complained of pain in the right knee. Examination showed very little tenderness to pressure, no redness, but a little fulness, particularly at the inner side of the patella. There was a suspicion of fluctuation. The next day there was more swelling and distinct fluctuation. Exploratory aspiration revealed a thick, creamy, yellow pus. The joint was opened and drained by Dr. D. W. Graham, two ounces of pus being removed. At the same time the left elbow was opened because of redness and tenderness, though no pus was found. No drainage-tube was here inserted.

There was no improvement in the general condition, which was one of high temperature, rapid, often uncountable pulse, dry tongue, delirium, subsultus, involuntary evacuations—in a word, that of a pronounced septicæmia or toxæmia. Death occurred early on the morning of January 1, 1902.

No autopsy was to be obtained, but the house physician, Dr. Loomis, immediately after death made a puncture of the pericardium, drawing off about two ounces of reddish-yellow fluid, which showed no growth in cultures. Blood from the heart also showed no growth on bouillon, gelatin, and blood-serum. The original pus from the puncture of the knee showed in smears an organism in pairs or short chains, the individual organisms varying somewhat in size, the majority being small and somewhat elongated. It stained by Gram's method; no capsules were seen. About ten drops of the pus were injected into the ear vein of a rabbit, but beyond producing a local reaction resembling a dry gangrene there was no result. Cultures on agar, glycerin-agar, bouillon, gelatin, and potato showed reactions that were identical with those of the pneumococcus. Unless transplanted every few days it quickly died out. Cultures from four agar tubes from two to four days old were scraped up, suspended in bouillon, and injected into the posterior ear vein of the same rabbit one week after his first injection with the pus. The animal appeared quite sick inside of twenty-four hours, but recovered. Its failure to cause death of the rabbit may have been due to a lack of virulence, or, in the first inoculation experiment, to the small dose employed, and, in the second, to the partial immunity resulting from the first inoculation.

I have seen two other cases of what were, I am quite sure, pneumococcic infection of a joint during the later days of a croupous pneumonia. As no cultures were made, however, the crucial proof is lacking. The first concerns a female child, aged two and a half years, who ran a typical course of croupous pneumonia, with involvement of the right lower lobe. Crisis on the tenth day. The next day the child cried whenever the left foot was touched, as in bathing. Over the tarsus, just below and in front of the external malleolus, was an area of redness, swelling, and extreme tenderness that appeared to involve a tarsal joint. There was no elevation of temperature. The lung was rapidly clearing. The heart valves were normal. In three days I was sure there was fluid, and urged consultation with a surgeon. This was flatly refused by the parents, who feared an operation and consented to take all responsibility for the non-surgical treatment of the trouble in the foot. In my own mind I was convinced that surgery would be necessary; but, to my surprise, after ten days there was distinct lessening of all evidence of inflammation, and in the course of three weeks the swelling and redness had disappeared. In six weeks the child was up and walking about without a limp.

In a second case, an adult male, the day after the crisis of an alcoholic pneumonia, complained of severe pain over the outer side of the right foot, where were seen some redness and swelling. Movement of the foot

and pressure caused great pain, the inflammation seeming to be in one of the tarsal joints. That night the patient had a convulsion, became delirious, had retraction and stiffness of the neck, with sharp rises of temperature, and died with the manifestations of an acute meningitis. No autopsy was permitted. Here, apparently, was a pneumococcic infection of the joint and of the cerebral meninges due to pneumococcic septicæmia, with metastatic localization in the joints and the meninges.

In adding these 21 cases to the list I follow the rule that Leroux and Cave have adhered to, with the single exception of Oliva's case, and include only such as were proved by direct examination of the fluid to contain the pneumococcus in the joint. Five other cases were, in all likelihood, of the same nature, and might, without straining one's conscience very much, be added to the list. Two in my own practice I have already alluded to. One case is referred to by Lippmann[15] as reported by Bernheim—an old rheumatic alcoholic with a double pneumonia, suppuration in the left scapulohumeral joint, meningitis, and death, the autopsy revealing vegetative endocarditis. Two of Preble's cases could also be safely classed here. The one concerned an adult male, who, several days after recovery from typhoid fever and erysipelas, had a right upper lobe pneumonia, with arthritis of right knee and left shoulder, with several abscesses of the soft parts. No cultures were made from the joints, but from an abscess of the back and from one of the scrotum the pneumococcus was recovered. The patient died, and no autopsy was permitted. His second case was in a child, aged fourteen months, with pneumonia of the left lower lobe. On the third day a swelling of the left hand appeared, with swelling and redness of several of the small joints. Pus from a periosteal abscess over the external condyle of the humerus revealed the pneumococcus. Later, other abscesses in the soft parts appeared, as did an otitis media, and there was a relapse of the pulmonary trouble. Ultimately recovery ensued.

Symptomatology. The clinical manifestations may be briefly described as those common to all acute inflammations of joints. The frequent occurrence of this complication during convalescence from pneumonia, at a time when the patient's mind is clear and the attention of the physician is not attracted too particularly to the lung, causes the complaint of local pain to be recognized by the patient and heeded by the physician. The pain varies in severity from that which is slight and has come on gradually to that which is of extreme severity and of abrupt onset. The tenderness is usually pronounced. The joint becomes rapidly or gradually swollen, and when the accumulation of fluid is great, fluctuation can be detected. There is also, in many cases, periarticular involvement. Redness, superficial tenderness, and wide-spread œdema may show that the inflammation is not confined to the joint proper, but

involves as well the structures about the articulation. The appearance of the joint in these cases is not unlike that seen in many cases of gonorrhœal arthritis, and the resemblance is the more striking when we remember the tendency of each of these forms of arthritis to attack the larger joints, only one or a few joints at a time, and for the inflammation to be permanent and not shifting from one joint to another. The periarticular œdema is more likely to be pronounced in the cases with a subacute course. Here, as shown by clinical and experimental observation, there is greater destruction of joint structures and greater invasion of surrounding tissues.

As regards the diagnosis in the cases with much periarticular swelling, it is to be remembered that the inflammation and the resulting abscess may be near or about the joint, and yet not involve the joint proper. Such periarticular localizations of the pneumococcus have been reported by Gabbi and Puritz.[16] Netter also refers to them. And in the County Hospital recently an autopsy was made on a patient in whom the pus was found to be not in the joint, as had been suspected during life, but in the subdeltoid bursa—a localization referred to as common by Netter. This case—one of Dr. Preble's—was an instance of a croupous pneumonia, with the abscess containing a pure culture of the pneumococcus. In the child with the abscess on the side of the foot—the case which I regarded as involving the joints of the foot—it is possible that the joint itself was not invaded, but that the abscess was periarticular.

The occurrence of an arthritis during the course of a croupous pneumonia, and especially during convalescence from the same, would naturally lead to the suspicion of a pneumococcic inflammation; and color would be lent to this supposition if the patient were an alcoholic or if his affected joint were the seat of a previous trauma or injury from rheumatism or gout. But an arthritis complicating pneumonia need not be due to the pneumococcus. Other organisms may enter the circulation and lodge in the joint. This point is well brought out by Mauclaire,[17] who quotes Smirnow[18] as finding in ten cases of pyarthritis complicating pneumonia five in which were found organisms other than the pneumococcus, such as the typhoid bacillus, the streptococcus, and the staphylococcus. It becomes necessary, therefore, to make an exploratory puncture of the joint, and, by smears, culture, and inoculation, to determine as to the presence of the pneumococcus and its degree of virulence. The existence of fluid and its character is thus determined in doubtful cases—a fact of no slight importance from its influence on prognosis and treatment.

Cases of single or multiple painful joints during or following pneumonia are referred to by Netter, who has seen several. In some of these slight local swelling is seen; in others the affection seems to be

little more than an arthralgia. Spontaneous recovery seems to be the rule.

The constitutional symptoms show great variations. In many cases the symptoms due to the bacteriæmia, or to the involvement of some important structure like the pericardium, pleura, or meninges, completely dominate the picture, and the joint symptoms seem wholly insignificant by comparison. High fever, rapid pulse, dry tongue, delirium—in a word, the clinical picture of a severe septicæmia—are present. Apparently, too, this can be present without true bacterial invasion of the blood, as the case of Allen and Lull seems to show, where toxæmia seemed to be the cause of the profound and fatal constitutional disturbance; and in my own case (Case LII.), though no autopsy was made, the examination of the blood during life did not reveal organisms, though the symptoms were of the most virulent type. In other cases the constitutional symptoms are relatively slight, except that the patient is weak and exhausted from his pneumonia, and makes but a slow convalescence. The joint involvement, when subacute in its course, may have but a slight influence on the temperature or pulse.

Prognosis. The prognosis is, from the nature of things, grave. The primary lung involvement is in itself serious, and the arthritis implies, at least in most cases, a bacteriæmia, with the probability of other metastatic foci of inflammation. The combined toxæmia and involvement of other structures often more vital than the joints—*e. g.*, the pleura, meninges, endocardium, or pericardium—must make the prognosis grave. Of the 52 cases 34 died and 18 recovered—a mortality of over 65 per cent.

Treatment. That pneumococcic infections of other structures are often relatively benign is well known. The prognosis in a pneumococcic empyema is better than where the trouble is due to the streptococcus. The treatment in these cases might, therefore, be less radical than in other cases of pyarthritis. Where, however, the fluid is purulent it would certainly seem wise to incise at once and drain the joint. It would seem to me questionable, however, whether several incisions, with numerous drainage-tubes or gauze drains, with free irrigation—in other words, whether too much manipulation of the joint—is advisable. In many of the acute and most virulent forms there are no solutions of continuity in the synovia or cartilage; the coarse insult to the joint from a radical and unusually thorough operation may be the means of causing local spread of the inflammation or of opening up more freely channels of absorption, so as to aggravate rather than ameliorate constitutional symptoms. There seems to be a general agreement among surgeons that a pleural empyema due to the pneumococcus is best treated by incision and drainage, without much disturbance of the pleura even by irrigation. May not the same be true of a joint?

In one of my cases (Case L.) a simple aspiration of the elbow-joint, with the removal of all the pus that could be withdrawn, resulted in recovery. Widal and Lesné[19] removed two drops of pus for diagnostic purposes from the sternoclavicular joint of their patient; a week later two more drops, the fluid this time seropurulent. Recovery followed in six weeks, which recovery may be called, as they themselves term it, spontaneous. These were cases in which thick, creamy, yellow pus was present. In several cases spontaneous recovery has followed where a thinner fluid, seropurulent or serofibrinous, has been present. In my case (Case LI.) recovery with a good joint followed the removal by two aspirations of a serofibrinous fluid. Netter says that even where there is redness, swelling, and exudate the lesion is susceptible of recovery by simple medical treatment of immobilization and compression. Raw had a recovery by aspiration.

While, therefore, the prognosis, for the reasons above stated, must always be uncertain and generally grave; and while, with pus in the joint, an early, free incision is to be advocated, it is well to remember that with serous exudate, and in a few cases even with purulent exudate, recovery has ensued either spontaneously or by the simpler measures of rest, compression, or aspiration. And we believe that in the arthrotomy, which should be done early when it is indicated, there should be as little damage as possible to the joint structures by unnecessary manipulation.

Pathology. The pneumococcus reaches the joint through the blood-current. The joint is occasionally primarily involved. Five of the reported cases are of this character. In one—that of Allen and Lull—there was no other part of the body infected, nor did the blood, post-mortem, reveal the pneumococcus. This would seem to show the great importance of toxæmia in such cases, this particular one being attended by unusually severe and even fatal constitutional symptoms.

The factor that determines the involvement of a particular joint is not always clear; yet experimentally it has been shown that a joint previously damaged is far more likely to be the seat of the local action of the pneumococcus when it is injected into the blood than one that has not been injured. (Gabbi, Ausset, Zuber.) Clinically, the occurrence of pneumococcic arthritis in joints recently sprained or bruised is so common as to excite comment of all observers and to be looked upon as more than accidental. Joints the seat of rheumatic, gouty, or saturnine damage are, according to some, especially prone to this form of arthritis.

A point of interest, and one not easy of an entirely satisfactory explanation, is the fact that this form of inflammation is especially prone to appear after the crisis of the pneumonia and when the patient seems past danger and well on toward convalescence and presumably immune.

The experimental work of Bezançon and Griffon[20] is in accord with these clinical facts. While working on problems of immunity, and while vaccinating rabbits against pneumococcic infection it was discovered almost by accident that suppurative arthritis occasionally appeared long after the injection of the microbe, and they concluded that pneumococcic arthritis is more likely to appear when inoculation is made with a culture that is attenuated through age, or when inoculation is made with a large dose—a brutal dose—of a virulent culture, but the animal rendered relatively immune by previous vaccinations. Possibly, as has been rather imaginatively expressed by Lippmann, the germ of feeble power having broken into the general circulation is unable to produce a generalized infection, is repelled on all sides, by the other stronger tissues and finally ensconces itself on the serous articular surfaces that are less able to defend themselves than other parts of the body. Leroux calls attention to the fact that this articular localization of the pneumococcus during convalescence from pneumonia is but an exemplification of a general pathological law that microbes of attenuated virulence are prone to lodge readily upon the various serous surfaces and especially upon the articular surfaces of the joints, and that it accords with the clinical observation that the articular determination of infectious diseases appears chiefly during the period of convalescence.

The changes that occur in the joints vary largely with the duration of the inflammation, and also undoubtedly with the virulence of the micro-organisms, as well as the resisting power of the body in general, and in particular the joint structures. In the acute cases often little more is seen than a synovitis, with redness and swelling of the synovia, and the ordinary histological changes of an inflammation of a serous membrane. The exudate varies from a serous or serofibrinous fluid to the more commonly found thick, creamy, yellowish pus, which contains the pneumococcus. In the same patient one joint may contain a purulent and another a serous exudate. In other cases, and particularly those of a subacute or more chronic character, the changes are more extensive and destructive. The cartilage may be eroded, the bone invaded, the ligaments destroyed, the tendon sheaths and muscles in the vicinity of the joint involved, so that the inflammation is a periarthritis as well as an arthritis. The destruction may be extreme as in the case—and that an acute one—of Fernet and Lorraine.[21] Here the autopsy showed that the left sternoclavicular joint did not in reality any longer exist. The peri-articular fatty tissues were infiltrated with serum, the muscles were disintegrated and marked with streaks of pus, the ligaments, the synovial membrane, the cartilages were destroyed and the articular surfaces were represented on the side of the clavicle, as well as of the sternum, by rough, denuded bone, exposing the spongy portion.

Strange to say, there was a minimum amount of pus in the joint cavity, though a virulent pneumococcus was found. In the cases of longer standing attempts at regeneration are made, and healing may occur, with more or less deformity from bony outgrowths and from the adhesions of scar tissue. The functions of the joint may, of course, be more or less interfered with in this way. In a rabbit that was killed seven months from the injection of the pneumococcus and six months from the first sign of lameness, the appearances of the joint reminded Bezançon and Griffon of an old fracture with vicious union and exuberant callus.

CONCLUSIONS. From my study of, and experience with, arthritis due to the pneumococcus, I would agree with nearly all of the conclusions reached by Leroux, some of which are here practically repeated:

1. It is a rare affection, found oftener in men, sparing no age.

2. It appears oftenest during or shortly after croupous pneumonia, sometimes as late as the third week after the crisis.

3. It may be primary in the joint, and severe and even fatal constitutional symptoms may result from the toxæmia thus induced; in these cases of primary pneumococcic arthritis pulmonary localization may or may not occur.

4. Previous damage to a joint as by trauma, rheumatism, or gout favors the localization.

5. The lesions may be limited to the synovia or may be more extensive, involving the cartilages and bones. The peri-articular structures may be involved. The subacute cases are sometimes highly destructive to the joint, and the same is true of some of the acuter ones.

6. The lesions are usually monarticular (61.5 per cent), the larger joints being oftenest involved. The knee is the joint most frequently affected. The joints of the upper extremity are affected a little oftener than those of the lower, but the difference is insignificant.

7. The condition is recognized by the ordinary signs of an acute or chronic inflammation of a joint. Exploratory aspiration, with bacteriological examination of the fluid, is the only means of recognizing the pneumococcic nature of the inflammation. The gonorrhœal arthritis and peri-arthritis have to be carefully excluded, as well as the arthralgias following pneumonia.

8. The prognosis is grave—mortality 65 per cent.—largely because of the accompanying bacteriæmia and involvement of other more vital parts of the body (meninges, pleura, pericardium, etc.). Yet spontaneous recovery occasionally follows, even where there is a purulent exudate.

9. The cases of suppurative pneumococcic arthritis should be treated by immediate incision and drainage. Serous arthritis may often be healed by aspiration, rest, and compression.

As this paper is going through the press there appears in the *Jahrbuch für Kinderheilkunde*, April 5, 1902, an article by Pfisterer, of Basel, on the same subject. Pfisterer adds several cases seen in children. He does not, however, refer to the monograph of Leroux, by all odds the best article yet written upon the subject.

BIBLIOGRAPHY.

1. Weichselbaum. Ueber seltenere Localisationen des pneumonischen Virus. Wiener klin. Woch., 1888, Nos. 28-32.
2. Leroux. Les Arthrites à Pneumocoques. Paris, 1899.
3. Cave. Pneumococcic Arthritis. The Lancet, January 12, 1901.
4. Vogelius. Les Arthropathies dans la Pneumonie croupale. Arch. de Méd. Exp. et d'Anat. Path., 1896, tome viii. p. 186.
5. Netter Charcot's Traité de Médecine, vol. iv. p. 913.
6. Nicolaysen. Norsk. Mag. f. Laeg., April, 1896, vol. xi. pp. 374-396.
7. Mühsam. Berlin. klin. Woch., September 27, 1897, vol. xxxiv. p. 855.
8. Heubner. Verhandlungen der Gesellschaft der Charité Aerzte, Sitzung vom 11 März, 1897. Berlin. klin. Woch., November 1, 1897, vol. xxxiv. p. 969.
9. Flament. Journ. de Sci. med. de Lille, 1898, vol. ii. p. 135.
10. Raw. Pneumococcus Arthritis, with Notes of Seven Cases. Brit. Med. Journ, Dec. 21, 1901, vol. ii. p. 1803.
11. Billings and Preble. Western Clinical Recorder, March, 1900; also Journ. Amer. Med. Assoc., August 19 and 26, 1899.
12. Preble. Pneumonia. Journ. American Med. Assoc., August 19 and 26, 1899.
13. Billings. Pneumococcus Infection, Western Clinical Recorder, March, 1900.
14. Allen and Lull. Pneumococcus Arthritis, Primary, in the Knee-joint. Annals of Surgery, October, 1901, No. 4, vol. xxxiv. p. 527.
15 Lippmann. Le Pneumocoque et les Pneumococcies. Paris, 1900.
16. Gabbi and Puritz. Centralblatt f. Bact. und Parasit. 1890, vol. viii. p. 138.
17. Mauclaire. Des Arthrites suppurées dans les principales maladies infectieuses. Arch. gén. de Méd., Jan., Feb., March, April, 1895.
18. Smirnow. Ueber die Gegenwart pathogener Microorganismen in den Gelenken bei einigen Infectionskrankheiten. St. Petersburg. Zeitschr. f. allgem. Veterinär med., 1895, p. 110.
19. Widal et Lesné. Arthrite et Synovite primitives à pneumocoques. Rheumatisme chronique préalable. Guérison spontanée. Bull. de la Soc. méd des Hôp., May 6, 1898.
20. Bezançon et Griffon. Étude Expérimentale des Arthrites à Pneumocoques. Arch. de Méd. Exper. et d'Anat. Path., 1899, 1er serie, tome, xi. p. 705.
21 Fernet et Lorraine. Note sur un cas d'infection pneumococcique à manifestations articulaires et méningée. Gaz. des Hôpitaux, April 2, 1896.

A CASE OF JACKSONIAN EPILEPSY CAUSED BY TUMOR OF THE BRAIN RELIEVED BY OPERATION; HEMIPLEGIA AND MUSCULAR ATROPHY; DEATH IN TEN MONTHS.[1]

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THE interesting points in this case from the medical point of view are its duration—seven years—the late period at which the symptoms other than Jacksonian epilepsy appeared, and the occurrence of great

[1] Read at the meeting of the College of Physicians of Philadelphia, April 2, 1902.

muscular wasting on the palsied side after operation. The history is as follows:

W. W., an unmarried white man, aged twenty-five years, consulted Dr. Burr in February, 1895. His family history was very bad. His father died of some brain disease accompanied by mental symptoms. One brother was insane for years, and another died of some acute brain disorder. The patient's personal history was good. He had never had any venereal disease and had never used alcohol. He had received an excellent college education, and was filling a position requiring much intelligence when he was taken ill. He dated the onset of his illness from March, 1894, at which time he had an attack described as follows by a friend who was present: Suddenly, and while apparently in good health, the left hand and mouth began to twitch, speech became inarticulate, the jerking movements spread over the entire body, and he became unconscious. The sphincters did not relax, nor was the tongue bitten. There was neither somnolence nor headache after the attack, which lasted about five minutes. During the following year he had seven similar attacks. Their duration varied from five to twenty minutes. They all began in the same way and followed the same course. He also had many attacks of momentary unconsciousness or partial unconsciousness without convulsions.

At my first examination he presented no signs of disease. He was a well-built, healthy looking-man. Gait and station were normal. There was no palsy of the cranial nerves, legs or arms. There was neither ataxia nor tremor. The knee-jerks were normal. The abdominal and thoracic viscera showed no evidence of disease. The urine contained neither albumin, sugar, nor casts, and was of normal specific gravity. His mental condition was good. He was somewhat depressed, but not more so than would be natural in a man who feared he was suffering from a serious malady. Speech was normal and his ability to write (he was right-handed) good.

Two weeks later I saw him in an attack. He suddenly stopped speaking. His eyes became fixed, looking straight forward. The mouth was drawn strongly to the left and the left hand became rigidly extended. Mouth and hand seemed to be affected synchronously. Still conscious, but speechless, he crawled from the sofa to the floor, and the tonic spasm extended to the left leg. In a moment the spasm became clonic and extended to the right side, but was not so severe as on the left, and he lost consciousness. The face was livid, the tongue bitten, the breathing stertorous, and he frothed at the mouth. He was unconscious about one minute and the entire attack lasted about five minutes. After it was over he remembered questions I had asked him at the beginning, and was able to tell how he came to be upon the floor. He had no headache or somnolence after the attack, and was mentally clear.

Dr. Thomas H. Fenton examined his eyes on February 23, 1895, and reported:

"I saw the patient first in March, 1894. The ophthalmoscope showed finer definition defective throughout, optic disks good size, liberally capillarized, but showing some quadrants of pallor, and with

degenerating borders; vessels easily emptied by pressure on globe; slight hypermetropic astigmatism, visual acuity, with and without glasses, good; muscular balance somewhat weakened, insufficiency both lateral and vertical; field of vision for white good, for colors markedly contracted. I made a correction of his optical defect, and three months later found some improvement in the color and definition of the fundus, noting, however, that there was still degeneration of the borders of the optic disks."

On March 15, 1895, Dr. Fenton reported further:

"I have taken his fields again with extreme care, and enclose a copy. I also went over his muscles, but I find no disturbance of muscular balance. The ophthalmoscope shows, especially in the right eye, some slight tortuosity of the superior vessels, with a disturbance of the definition of the visual margins. There is no marked alteration in capillarity. His pupils are fairly active and show nothing noteworthy; his visual acuity is up to the standard for near and far, with and without correcting lenses. I think the fields are really more contracted than is shown in the diagram. They are symmetrically correct, but I think they would bear general contraction."

In February, 1897, Dr. Archibald G. Thomson examined his eyes and found the fundus normal.

He was treated with many drugs with little result. The major convulsions occurred at irregular intervals, sometimes several in a month, sometimes none in several months. The minor attacks of momentary unconsciousness occurred daily, and sometimes oftener. Rarely was he free from attacks of either kind for several weeks. In February, 1900, he had an attack lasting several hours, in which the only symptom was continuous twitching of the left hand. Dr. Thomson examined his eyes again on February 23, 1900, and found that "in the right eye the veins were just becoming a trifle enlarged. There was possibly the faintest evidence of swelling of the disk which was hardly present three days before. In the left eye there was decided evidence of neuritis, especially on the nasal side. As you know, afterward the swelling of the disks developed very rapidly, producing a swelling of 6 or 7 D. in a few weeks."

In the latter part of February he began to complain of headache. He described it as stabbing and shooting, but could not localize it definitely. It would come on suddenly, last for hours, and pass off gradually. In May his eyesight rapidly failed on account of the rapidly increasing choked disk in each eye.

My diagnosis was tumor of the brain. As long as he presented no other symptom than Jacksonian fits I was unwilling to make a positive diagnosis as to the nature of the trouble, but when headache and choked disk were added I felt sure of the existence of a tumor. Its location was more difficult to determine. The motor cortex itself, or

the white matter immediately under it, could scarcely be the primary seat of the disease because of the entire absence of palsy. The preservation of sensibility in all forms, and of the stereognostic faculty excluded the region immediately posterior to the motor area, or, if we accept the motor cortex as being also sensory, then the preservation of sensibility helped to exclude the motor cortex. On the other hand, it seemed the tumor must be situated near the motor cortex or the convulsions would not all have begun locally. A tumor situated at a distance may cause a fit which begins locally, but scarcely a whole series extending over years, all of which begin in the same extremity and run the same course. Hence, I located, for operative purposes, the tumor in the prefrontal lobe, adjacent to but not invading the motor area. A meningeal tumor over the motor area could also have caused the symptoms. As the patient was rapidly growing worse, the headaches becoming more frequent, and the eyesight dimmer, I sent him to Dr. William J. Taylor, who admitted him to the Orthopædic Hospital and Infirmary for Nervous Diseases in June, 1900, with a view to operation. Dr. Archibald Thomson examined his eyes on June 6th, and reported:

"Pupils are equal and react normally. The media are clear. There is marked choked disk in the eye, the swelling about four diopters, with several small hemorrhages over the disk. No hemorrhages apparently in the fundus. The form and color fields are normal. No hemianopsia. At present he does not have any diplopia for distance, but during his illness he complained a great deal of it, although no apparent squint. As he finds it much more difficult to turn the eye to the right than to the left, I take it that he has a weakness of the right external rectus and that when he had his diplopia it was due to a paresis of the right externus."

On June 12, 1900, he was operated on by Dr. William J. Taylor, who will discuss the surgery of the case. Immediately after the operation there was a left-sided hemiplegia, including the face, with hemianæsthesia to touch. Deep pressure he could feel, but could not localize. At first he was speechless, but on the following day he could use single words, though he frequently made mistakes. Some days after the operation the disks were much less swollen and vision had greatly improved.

On the day of his discharge from the hospital, August 6, 1900, he could feel touch, but could not tell whether an object were sharp or blunt. A deep prick he felt as pain, and deep pressure was felt distinctly. There was beginning contracture of the left wrist. Wrist clonus was present on the left side, ankle clonus was absent. The left arm was completely palsied. He could move the left leg a little by action of the hip muscles. Speech was very slow. He neither misused nor mispronounced words, but said he was compelled to stop to think of them. One week after leaving the hospital he had a convulsion affecting the right side only and not accompanied by unconsciousness. (This was the only convulsion of any kind after the operation.) He slowly improved, and on September 4, 1900, his condition was as follows: He could walk, but with distinctly hemiplegic gait. He could slightly flex

and extend the forearm and lift the arm a little by the shoulders, but could not move the fingers, which were strongly flexed upon the palm. There was slight lower left face palsy. The tongue protruded straight. There was wrist clonus and ankle clonus on the left side. The left biceps tendon-jerk was increased. The right knee-jerk was a little too active, the left was very spastic, that is, it was quick, rapid, and the foot did not fall, but was pulled back. Tactile sensibility was normal on the face and somewhat blunted on the left leg and arm. He understood all that was said to him, and could read aloud slowly but understandingly. He could write correctly without difficulty, but had trouble in spelling words aloud. On September 21st he was seized with pain in the frontal region, lasting several hours. He had many similar attacks of headache, in all of which speech was greatly affected, but without increase of palsy. Sometimes the headache was followed by coma lasting several hours without convulsion. In October he began to retrogress rapidly, and by the end of the month he could not walk nor move the arm, and at times he was mildly delirious, at others in coma for several hours. In March there was absolute palsy of the arm and leg, and some palsy of the lower part of the face. The palsy was flaccid and without the slightest rigidity. There was great muscular wasting in the left forearm and hand, some, but not so marked, in the calf, thigh, and shoulder. The wasting came on acutely. The biceps tendon-jerk was very active on the left side. The knee-jerk was scarcely present on either side. Wrist and ankle clonus were absent. On the right there was a slight normal plantar jerk, on the left none. There was complete insensibility to touch, pressure, temperature, and pain on the left arm and leg. The anæsthesia was not bounded by a distinct line, but faded off on the shoulder and neck. On the face sensibility was normal. He was almost blind. The pupils were widely dilated. The bowels were moved only by injections. The bladder was incontinent. The attacks of coma became more frequent, and he finally died in one on April 25, 1901, seven years after the onset of the trouble. A necropsy could not be obtained.

Notwithstanding the absence of a necropsy there is much that is interesting in the case. Though Dr. D. G. McCarthy's and my own microscopical examination of the tissue removed at the operation failed to reveal any evidence of tumor, still I think a tumor was present, but deeply seated. The inflammation present in the part removed may have been caused by a tumor in the neighborhood. The only other diseases that could have caused the Jacksonian fits are idiopathic epilepsy, Bright's disease, and chronic lead-poisoning. The last two were excluded by repeated and careful examination for the other signs and symptoms. In idiopathic epilepsy the fits may in rare cases begin locally, but choked disk never occurs. Surely Jacksonian fits, choked disk, and headache of the kind this man had are sufficient grounds on which to base a diagnosis of tumor. At the operation we were misled by the pathological appearance of the brain, and removed an area of inflammatory tissue, leaving the tumor behind. This is an error which has been made before, and which will occur again.

The muscular wasting is of interest because the influence of the motor cortex on muscular nutrition is still undetermined. In the hemiplegias of infancy there is often retardation of growth upon the palsied side, affecting not only the muscles but also the bones. Not infrequently in hemiplegia occurring in adults there is a gradual decrease in the volume of the paralyzed extremities, and especially the arm. This is always slow in progress, never reaches more than a moderate degree, and is not a true atrophy. It is brought about by disuse, exercise certainly being a stimulus to muscular nutrition, and probably by the smaller volume of the blood, the circulation being less active in palsied parts. There is also sometimes less subdermal fat on the hemiplegic side in cases of old palsy. The wasting in our case was of an entirely different and much rarer kind. It was a true melting away of muscle fibres. It came on acutely nine months after the operation, progressed very rapidly, picked out individual muscles, or rather groups of muscles, in the forearm and hand especially, and with its appearance the contractures disappeared and the deep reflexes were abolished. It is curious that the knee-jerk on the right side was greatly diminished at the same time. The absolute anæsthesia antedated the wasting, and it is probable the two conditions were independent of each other. The wasting resembled that which occurs in acute disease of the anterior horns of the spinal cord.

In recent years quite a number of cases of muscular atrophy occurring in central palsies have been reported. The nature of the disease seems to be of no importance. Wasting may occur after hemorrhage, embolism, or thrombosis, and during the course of a tumor. The location of a central disease also seems to be of no importance, provided it is somewhere in the motor tract. Wasting may follow disease in the basal ganglia, the white matter, or the motor cortex. The duration of the cerebral disease is of some importance. Usually the wasting occurs some weeks or months after the onset of the primary disease, and it may come on at an even later time. A few very early cases have been recorded.

There are several theories to account for true muscular atrophy in cerebral palsy. Charcot held that the descending degeneration of the pyramidal tracts is continued into the anterior horns. But later investigations have shown that there may be atrophy without descending degeneration. Another theory is that the motor cortical cells and certain cells in the basal ganglia have trophic functions. Some authors explain the matter by saying that there may be a dynamic disturbance of the anterior horn cells without visible disease. The weight of evidence is in favor of the opinion that the cells of the anterior horns are the true trophic centres of the muscles. The percentage of cases without evident spinal cord disease, never very large, is growing smaller

with improvements in the methods of examination. If the motor cortex or the basal ganglia exerted a trophic influence the cases should be common instead of rare. The fact that total transverse lesions of the spinal cord high up are not followed by wasting of the legs, unless there is also disease of the lumbar swelling, is also against the existence of a cerebral trophic muscular centre. The whole matter is as yet too obscure for dogmatic statement. Though it is probable that there is always disturbance of the anterior horns, how cerebral disease causes it is unknown.

Apart from these cases local atrophy from traumatic neuritis is not uncommon in hemiplegia. My impression is, though I cannot prove it by statistics, that the nerves in palsied parts are more susceptible than in health. We often see a trifling injury to the shoulder, which in a healthy man would soon be recovered from, followed in hemiplegics by neuritis and atrophy. Local atrophy may also be caused by the neuritis associated with the arthritis which occurs in hemiplegia. Indeed, arthritis has been claimed to be the cause of the general wasting, but this seems hardly true.

Another rather unusual point in the case is the long duration of the disease, from March, 1894, until February, 1900, before any other symptom other than the fits appeared. As a rule, the march of cerebral disease is much more rapid.

Operation, June 12, 1900, by Dr. William J. Taylor.

A large osteoplastic flap in the right parietal region over the Rolandic area was made by means of Pyle's chisels. The time consumed in opening the skull was thirty minutes. The dura was very tense, but more so over the site of the supposed tumor. There was no pulsation when the dura was opened, but there was great tension, and when the dura was cut and turned down a mass of brain tissue immediately presented itself in the pre-Rolandic region and pushed outward to such an extent that it was presumed to be a tumor. The exact topography of the brain could not be definitely determined, as the amount of tension and protrusion of the substance of the brain prevented it. An effort was made to enucleate this protruding mass, but it was found to be impossible, as it had no distinct outline. A large mass, however, was taken out, partly by cutting and partly by scooping with the fingers and a spoon, the whole mass removed being about the size of a small hen's egg. This did not have the same feel as the surrounding tissue, being distinctly more dense and easily separated. It was immediately put in 5 per cent. formalin for microscopical examination. The hemorrhage at a few places was quite profuse, and especially where the larger veins of the pia were torn. This was controlled by silk ligature, and the oozing from the surface and from the cavity from which the brain tissue had been removed was easily checked by a small amount of iodoform gauze packing. The dura was then carefully sutured with silk, the iodoform gauze removed, and the whole wound in the dura accurately approximated except at the anterior border, for

here the pressure of the underlying brain tissue was so great that this could not be done. The wound was then closed by silkworm-gut sutures. Following the operation his recovery was continuous and uneventful. His temperature, at no time high, speedily reached normal, and although for a number of days there was quite a free discharge of blood and broken-down brain tissue, this gradually lessened until it finally ceased. His appetite was good, he slept well, and had only occasional twinges of headache. Following the operation there was total palsy of the left side. He was examined daily from the neurological stand-point by Dr. Burr, who tested him both as to sensation and reflexes. Surgically he was well in ten days.

For the slight pains in his head he was ordered inunctions of mercurial ointment, which had in the past relieved him.

The pathological findings in this case have been to me most perplexing, for I was quite certain we had had to deal with a subcortical infiltrating growth, and so believed until the report of the microscopical examination was made. The brain bulged immediately the dura was opened, and it was thought that the protruding mass was more dense than the surrounding cortex. The gray matter was discolored, not normal in appearance, and, although there were no distinct limits to this supposed growth, it separated easily and seemed of different texture.

This apparent change in the cerebral substance must have been caused by the congestion of the intracranial pressure and to the manipulation during the operation. I firmly believe a tumor was present in the deeper structures, but of such a density that it gave no evidence of its presence by palpation.

Some years ago, in assisting Dr. Keen in an operation upon a case of tumor of the cerebellum, search was made in various directions with a probe, and no difference in resistance or density whatever could be demonstrated, yet at the death of the patient some six weeks afterward a large sarcoma was found and in such a portion that the probe must have passed completely through it in several directions. I have never yet seen such a condition of tension and protrusion of the cerebral substance after the dura was opened, unless a distinct new-growth was found at subsequent autopsy. I regret extremely that no examination could be obtained in this case to demonstrate the correctness of this assertion.

The cortex and the substance of the brain are both so extremely sensitive to the gentlest manipulations, and changes in their color and appearance occur so rapidly, that it may be difficult to say positively at the time of operation whether there be true pathological changes. This was the case in one instance where the amount of intradural pressure was so great that the cortex was lacerated by being pressed against the cut edge of the dura, and it was only after some of the bruised tissue was placed under the microscope that its true nature could be absolutely demonstrated.

Certainly we have very much yet to learn concerning the conditions

found in these cases of suspected cerebral new-growth and of the macroscopical appearance of the cortex and underlying tissues.

Remarks. There are certain points in the surgical treatment of tumors of the brain, and particularly in the technique of operation, which are of great interest.

An osteoplastic flap which makes a large opening in the skull should always be employed. This permits of careful examination of the dura before it is opened and before there is bulging of the brain. In cases of great intracranial tension this permits of the examination of a wide area, and can be done almost as quickly as if the opening were made by a large trephine (from one and one-half to two inches in diameter). It gives greater space in which to work, and does not necessitate the use of a rongeur forceps to cut away the edges of the bone. It enables this bone flap to be replaced, thus covering the opening in the skull with a solid protection, and prevents the danger of injury to the brain by subsequent accidents. A small trephined opening should be made at one of the angles of the incision to test the thickness of the skull, and when this is ascertained the chisel may be used with greater speed and without danger of doing damage to the dura. The electric engine, if of sufficient power, is the ideal method of making this flap, and the reason why it is not more generally used is from want of familiarity with it on the part of the surgeon. The objections which have been raised to it have been the danger of sepsis, but this I consider easily avoided by care in manipulating the machine, and the difficulty in controlling the speed and movements of the cutting instruments. The use of the chisel and mallet is undoubtedly very satisfactory, but has several disadvantages. The first is the length of time which it takes to open the large flap in the skull—this varies, according to the thickness of the bone, from thirty to fifty minutes, working as rapidly as it is safe to do —because we must bear in mind the possibility of the chisel slipping through and wounding the dura and brain. Although it is said that the hammering of the mallet and continual tapping and knocking against the bone does no harm, I cannot see why damage is not done if this is kept up for any length of time. We know what severe headache and how much disturbance would be produced to our own heads if such a method were used, and I think anything that will get rid of this is a distinct advantage.

Hemorrhage of the scalp is frequently very severe and often difficult to control, and particularly is this the case in dural growths, where just the opposite condition would be expected. Usually hæmostatic forceps are sufficient, but it is my intention in the next operation for suspected dural growth with great congestion of the vessels of the scalp to use catgut basting threads to control the bleeding from both sides of the incision in the scalp. Horsley's bone putty is of the greatest

value in controlling the bleeding from the bone, and may be used freely while the chiselling is being done. New-growths of the dura in my experience have always been accompanied by a very congested scalp, from which the hemorrhage is most profuse, and it is very pronounced also from the vessels in the dura and from the small penetrating vessels between the dura and the inner surface of the skull. I have seen but one case of new-growth of the dura, and that a fibroma of many years' standing, recover after operation. All the others, now a considerable number, have died of hemorrhage, none living longer than eight or ten hours after the operation, and yet this is remarkable, as in all of them the growth was absolutely limited, not attached to the substance of the brain itself and easily shelled out. On the other hand, I have seen case after case recover where the growth was infiltrated and deep in the substance of the brain itself, and I always feel that the chance of operative recovery in these cases is very good, but the likelihood of recurrence and ultimate destruction of the patient by the growth is, of course, very certain.

In the future I propose in all instances of dural growths to baste the edges of the wound in the scalp, to open the bone quickly with a chisel, or, preferably, with the electric engine, and raise a large osteoplastic flap. Now, if there be much free hemorrhage from the vessels of the dura, and, as a rule, this hemorrhage is from all over the surface, and not from any one or two large vessels, I propose to pack the wound with several layers of gauze, replace the bone flap and bind it tightly to the skull and wait for a couple of days before proceeding to take out the growth. At the end of this time the bone flap is again to be turned back, the dura opened, and the tumor removed.

I am quite confident that many cases of operation for brain tumor are unsuccessful surgically from our desire to complete the operation at one sitting, and that if we would exercise a little more care in guarding against hemorrhage, and especially venous hemorrhage, our results would be better. I have repeatedly seen death occur from venous hemorrhage from the dura and scalp; it is very difficult to control by ligature and clamp, and the prostration generally seems to be out of all proportion to the quantity of blood lost. In other parts of the body I have frequently seen much greater hemorrhage without the same collapse. The long-standing congestion incident to intracranial pressure seems to destroy the contractility of the vessels.

TWO CASES OF PARTIAL INTERNAL HYDROCEPHALUS FROM CLOSURE OF THE INTERVENTRICULAR PASSAGES:

WITH REMARKS ON BILATERAL CONTRACTURES CAUSED BY A UNILATERAL CEREBRAL LESION.[1]

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(From the William Pepper Laboratory of Clinical Medicine, Phoebe A. Hearst Foundation.)

INTERNAL hydrocephalus is not a very uncommon finding at necropsy, but the cause of the increase in the amount of the cerebrospinal fluid within the ventricles has often eluded detection.

Two cases that have come under my observation, and have been studied by means of microscopical sections, have shown that the hydrocephalus was the result of closure of the interventricular passages, each case being one of partial dilatation of the ventricular cavity.

Partial internal hydrocephalus is more uncommon than is the form of the disease in which all the ventricles of the brain are implicated, and affords a better opportunity for determining the location of the primary lesion.

It is not necessary to study the different works on hydrocephalus very exhaustively to find that actually observed lesions are much rarer than theories explanatory of the causes of hydrocephalus. Oppenheim,[2] in the recent third edition of his text-book, remarks that we have very little positive knowledge regarding the pathogenesis of congenital hydrocephalus. It is assumed, he says, that an inflammatory condition of the ventricular ependyma, or an occlusion of the communicating passages between the ventricles, or between the ventricles and the subarachnoid space, is the cause. It is certain that this occlusion may be a cause of congenital hydrocephalus, but it is not known how often it occurs. Great importance is attributed to it by d'Astros, Boenninghaus and Dexler, and pathological findings showing that occlusion of these spaces may cause hydrocephalus are reported by Luschka, Monro, Neurath, and Bourneville and Noir.

Birch-Hirschfeld[3] and Ziegler[4] also say that the cause of internal congenital hydrocephalus is obscure. They refer to the various theories offered, and Ziegler states that in a few cases of unilateral hydrocephalus the foramen of Monro has been found closed, but he does not mention the names of those who reported these cases.

[1] Read, in abstract, at the meeting of the American Neurological Association, June, 1902.
[2] Lehrbuch der Nervenkrankheiten, third German edition, p. 811.
[3] Lehrbuch der pathologischen Anatomie. [4] Lehrbuch der speciellen path. Anatomie.

Dexler[1] has studied internal hydrocephalus in the horse, and believes that the condition in this animal is caused by occlusion of the aqueduct of Sylvius.

In the case of hydrocephalus in a child, published by Bourneville and Noir,[2] the aqueduct of Sylvius was completely obliterated and the fourth ventricle was only slightly dilated. A microscopical examination of the tissues apparently was not made.

Neurath's[3] case was one of occlusion of the foramen of Magendie.

A case similar to the second case reported by me in this paper has recently been placed on record by Touche.[4] The patient, a child, was in perfect health until the age of four years. At this period of its life it had repeated convulsions, and the head gradually increased in size, and both sides of the body became paralyzed. The lower limbs remained paralyzed, but some power was regained in the upper limbs. The patient lived to be twenty-nine years old. At the necropsy the

FIG. 1.

Unilateral internal hydrocephalus, causing bilateral contracture. Photograph taken after death. (Case 1.)

fourth ventricle was found to be of normal size, but the aqueduct of Sylvius was completely obliterated, and the third and lateral ventricles were greatly dilated. A microscopical examination of the specimens is promised.

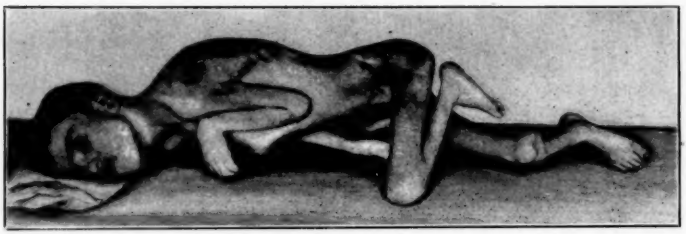
A case of unilateral hydrocephalus has recently been reported by W. C. White.[5] A woman, seventy-four years of age, had repeated hemiplegic attacks of comparatively short duration. The limbs on the paralyzed side were one centimetre less in size than those on the opposite side. The hemiplegic attacks had been diagnosed during life as the result of embolism. Intense unilateral internal hydrocephalus was found, the only causative lesion being obstruction in the left

[1] Neurologisches Centralblatt, 1899, p. 977.
[2] Le Progrès Méd., July 14, 1900, p. 17.
[3] Neurologisches Centralblatt, 1896, p. 87.
[4] Bulletins et Mémoires de la Soc. Méd. des Hôpitaux de Paris, 1902, No. 7, p. 141.
[5] W. C. White. American Journal of Insanity, vol. lviii., No. 3, p. 503.

choroid plexus. The foramen of Monro was patent. White refers to a case of unilateral hydrocephalus following tapping for congenital hydrocephalus reported by Baskett.

The first case that I report in this paper was one of unilateral internal hydrocephalus. The right cerebral hemisphere was a mere sac, while the left was normal. Bilateral contracture from this unilateral cerebral lesion was very intense. Bilateral contracture from

FIG. 2.



Unilateral internal hydrocephalus, causing bilateral contracture. Photograph taken after death. (Case 1.)

unilateral lesion is uncommon. The patient was an inmate of the New Jersey Training School for Feeble-minded Children. For the photographs (Figs. 1 and 2) I am indebted to the principal of the school, Mr. E. R. Johnstone.

Little is known of the history and clinical condition of E. R. At the time of death he was fourteen years and eight months old, and had been in the New Jersey Training School for Feeble-minded Children four and a half years. He came from the Hudson County Almshouse, and his parents were unknown. He was said to have had no convulsions during the time he was at the almshouse. He walked when he first came to the training school, but his gait was peculiar, and he went up and down stairs with difficulty. He was an idiot, and was never heard to speak. His ocular condition was unknown.

The following notes were made by Dr. Wilson, December, 1899. "The record of April 1, 1897, says: Ezra was quite sick last month, and was in bed for a number of days. Since then he has been more helpless than usual, and does not stand or walk.

"He has become more helpless the past year, so that he could not sit up straight. Since June, 1897, he has been bedfast."

Notes by Dr. Corson, August, 1897: "When E. R. was admitted he could walk and help himself quite a little, but since his last sickness he is entirely helpless; cannot walk, stand, or sit up, but lies down all the time. He had five spasms in the month of July."

The boy had several severe convulsions during the week ending December 9, 1899, and had been having them for at least two or three years. He died December 10, 1899. I never saw the boy during his life.

The necropsy was made by me Tuesday, December 12, 1899, at 10.30 A.M. I am indebted to Dr. C. W. Burr for the pathological material. My notes are as follows:

The left lower limb is firmly contractured at the knee and hip, so that the posterior part of the left leg is closely drawn to the posterior part of the left thigh. The left thigh is contractured on the pelvis to a right angle with the latter. The left leg can scarcely be extended at all at the knee, and the left thigh cannot be extended at the hip beyond a right angle with the pelvis, and when the left thigh is moved the pelvis is moved with it. The right leg lies at a right angle with the right thigh and cannot be extended beyond a right angle. The right thigh lies at an oblique angle with the pelvis, and the movement at the hip-joint is exceedingly limited. The left lower limb is much smaller in circumference than the right. The middle of the left leg measures 13 centimetres (5⅛ inches) in circumference; the middle of the right leg measures 15 centimetres (6 inches) in circumference; the middle of the left thigh measures 18 centimetres (7⅛ inches) in circumference; the middle of the right thigh measures 22.5 centimetres (8⅞ inches) in circumference; the right thigh from the great trochanter to the head of the fibula measures 28 centimetres (11 inches); the left thigh measures 28 centimetres (11 inches); the right leg from the head of the fibula to the external malleolus measures 28 centimetres (11 inches); the left, 28 centimetres (11 inches). The left foot is smaller than the right, and the fourth toe is almost the same size as the fifth toe on the left side.

The right arm from the greater tuberosity of the humerus to the external condyle measures 23 centimetres (9 inches); the left, 22 centimetres (8⅝ inches); the right forearm from the external condyle to the styloid process of the radius measures 18 centimetres (7⅛ inches); the left, 16.5 centimetres (6½ inches). The middle of the left forearm measures 10 centimetres (4 inches) in circumference; the middle of the right forearm, 10.5 centimetres (4⅛ inches) in circumference; the middle of the left arm, 11.5 centimetres (4½ inches) in circumference; the middle of the right arm, 15.5 centimetres (6¼ inches) in circumference.

The right upper limb is fully extended, but the fingers show slight contracture. When the right hand is flexed on the forearm the fingers can be fully extended, but when the right hand is extended the fingers are flexed and cannot be extended—*i. e.*, the flexor tendons are shortened.

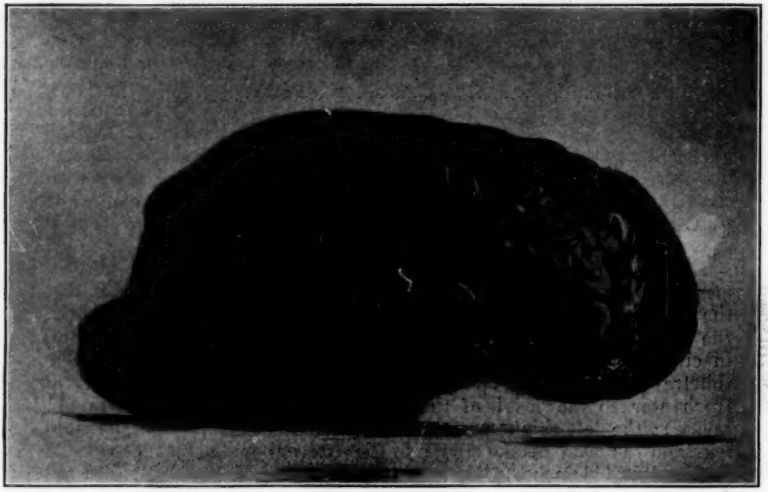
The ends of the fingers of the right hand are very blue. The left arm is firmly drawn to the side of the thorax, and can only be moved slightly. The left forearm is at an acute angle with the left arm, and cannot be extended at all. The fingers are mainly in extension, although there is a tendency to flexion.

The thorax is markedly pigeon-breasted, but other signs of rickets are not very evident.

The circumference of the head is 46.5 centimetres (18¼ inches). The distance from glabella to inion is 28 centimetres (11 inches). The lower part of the face is protruding. The forehead is narrow. The pupils are equal. The left corner of the mouth is slightly higher than the right, as though facial contracture were present on the left side.

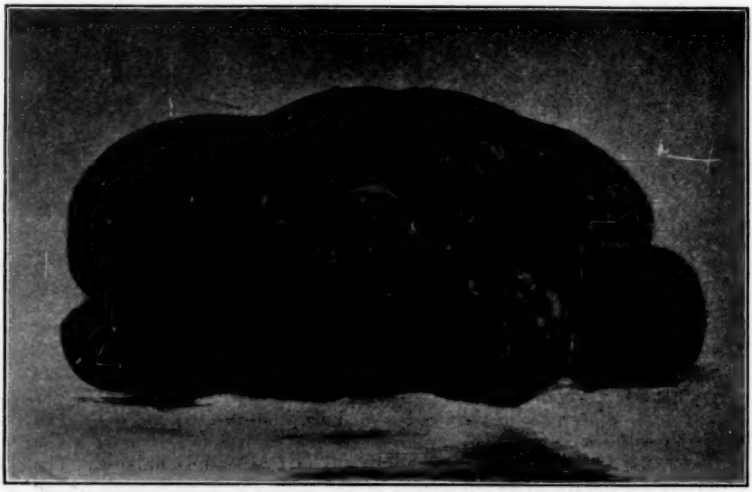
The skull is exceedingly thick, especially in the right frontal region,

FIG. 3.



Brain from a case of internal hydrocephalus of the right cerebral hemisphere. The right cerebral hemisphere was much smaller than the left, and was merely a thin-walled sac. (Case 1.)

FIG. 4.



Basal aspect of brain from a case of internal hydrocephalus of the right cerebral hemisphere. The left lateral lobe of the cerebellum is much smaller than the right. (Case 1.)

where it measures 1.2 centimetres (½ inch). Before the dura is cut the frontal lobe on the right side is much less prominent than that on the left side. The brain is not very œdematous. The right cerebral hemisphere measures 15 centimetres (6 inches); the left, 16.5 centimetres (6½ inches). The resistance to the finger on palpation is much less over the frontal area of the right side than over the corresponding area of the left side, while the brain is within the cranium. The entire right cerebral hemisphere forms the wall of a cyst. (Figs. 3 and 4). The weight of the brain is 26.5 ounces. The cerebro-spinal fluid on the exterior of the brain is not abnormal in amount. There is a distinct kyphosis involving the entire vertebral column.

The pericardial fluid is small in amount. The heart weighs 43 ounces. A chicken-fat clot is found in the right ventricle. The tricuspid valve is normal. The wall of the right ventricle is thin. The pulmonary valves are normal. A chicken-fat clot is found in the left ventricle. The aortic valves are normal.

No excess of fluid and no adhesions are found in the pleural cavities. The right lung weighs 4 ounces and is crepitant throughout. A piece of this lung placed in water floats. The left lung is crepitant and shows hypostatic congestion. Weight of left lung is 7.5 ounces.

The liver extends to within two fingers' breadth of the last rib. The liver on its under surface and the adjoining structures are deeply stained with bile. Numerous apparently fatty areas are found in the liver. The weight of the liver is 14.5 ounces.

The right kidney contains numerous cysts and also a pus cavity. One of the cavities is filled with a cheesy granular mass. The right kidney weighs 2.5 ounces.

The right suprarenal body appears to be tuberculous.

The left kidney is much larger than the right. The capsule strips easily on each kidney, and no cysts are found in the left kidney. The weight of the left kidney is 4.5 ounces. The left suprarenal body is normal.

The spleen is small and apparently normal in appearance. It weighs 1.5 ounces.

The wall of the bladder is not thickened and is filled with purulent urine.

A series of microscopical sections of the basal ganglia of the right cerebral hemisphere and sections of the pons and parts below were made. The structures of this cerebral hemisphere were found much atrophied. The choroid plexus was much thickened at the right foramen of Monro, and contained numerous masses of cells with round nuclei. A nodule, in continuity with the external wall of the foramen, projected into the foramen. This nodule at one part was bordered by cells with round nuclei several layers deep, and these were evidently derived from the ependymal lining. Similar layers of cells, derived from the ventricular ependyma, bordered the external wall of the foramen and the adjoining parts. The nodule was composed of tissue like that of the brain substance, although its structure resembled also fibrous connective tissue. The inner wall of the right foramen of Monro contained a small nodule in which were many cells with round nuclei, and the nodule projected slightly into the foramen. The alteration of the walls of the left foramen of Monro was slight. The pyramidal tract on the right side of the pons was much smaller than

that on the left, but the bundles of fibres present in the pyramidal tract on the right side were very slightly degenerated, as shown by the Weigert hæmatoxylin stain. The right anterior pyramid was only slightly degenerated, but it was smaller than the left. The left crossed pyramidal tract in the spinal cord was slightly degenerated. The right crossed pyramidal tract in the spinal cord appeared a little less deeply stained by the Weigert hæmatoxylin method than the surrounding parts of the antero-lateral column. The nerve cell bodies in the anterior horns of the cervical and lumbar regions were equally numerous on the two sides and apparently normal in form and number.

SUMMARY. The patient, a boy, was fourteen years and eight months old at the time of death. Little is known of his history, as he had come from an almshouse. Four years before death he had been able to walk with difficulty and to ascend stairs, but he gradually lost this power and became bedridden. Contractures were very pronounced in

FIG. 5.

Photograph of a microscopical frontal section of the right occipital lobe (natural size), showing great distention of the posterior horn of the lateral ventricle. The walls of the posterior horn have become approximated during the process of hardening. (Case 1.)

the left limbs, and also, but to a less extent, in the right lower limb and fingers of the right hand. The right cerebral ventricle was intensely dilated, so that the ventricular wall in some places was very thin, the occipital lobe at parts being only ⅛ inch thick. (Fig. 5.) The right internal hydrocephalus was the result of partial closure of the right foramen of Monro from inflammatory changes about this foramen, and the condition must have been congenital or have developed early in life, as shown especially by the arrest of development of the left upper limb. The cause of these inflammatory changes and proliferation of neuroglia at the foramen of Monro is unknown, but it may possibly have been the result of tuberculosis, as a condition of some of the viscera suggestive of tuberculosis was found. Anglade[1] has described neurogliar pro-

[1] Revue Neurologique, February 15, 1902, p. 113.

liferation in the walls of the ventricles, occurring in cases of general tuberculosis, and produced by the toxin of the tubercle bacillus. This neurogliar proliferation resembles very closely that found in cases of cerebral syphilis or paretic dementia. These ependymal nodules do not contain bacilli. Probably there are many causes for neurogliar proliferation of the ventricles.

Notwithstanding the very intense muscular atrophy in this case the cell-bodies of the anterior horns of the lumbar and cervical regions appeared to be normal. This finding is important and shows the difficulty of explaining muscular atrophy in hemiplegia as a result of tertiary degeneration—*i. e.*, a degeneration of the cell-bodies of the anterior horns of the spinal cord resulting from the degeneration of the pyramidal tract.

Bilateral contracture from unilateral cerebral lesion is not mentioned in most of the text-books, and is of rare occurrence, especially in the intensity observed in my case. It seems to be almost unknown outside of the French school.

Brissaud,[1] in his monograph on hemiplegic contracture, published in 1880, refers to an observation of Poumeau, reported by Hallopeau,[2] in which a hemiplegic became paralyzed on the "sound" side. Hallopeau believed that the extension of the paralysis was the result of extension of secondary myelitis. In this monograph Brissaud stated that there were many hemiplegic women in the Salpêtrière who after a certain number of years had become paralyzed, and the paraplegia was complicated by contracture to such a degree that the thighs were drawn against the abdomen and the chin touched the knees, and extension of the lower limbs had become impossible. He gives two illustrations of this bilateral paralysis, in each of which one lower limb was considerably more contractured than the other. Brissaud thought that these cases were not very rare, but as regards the pathology he could merely say that some day we should learn the cause of this bilateral paralysis.

Paul Dignat,[3] writing in 1883, remarked that secondary contracture is not always limited to the hemiplegic side. In the great majority of cases, he says, it is found only in the limbs of the paralyzed side, but in some cases it develops in both lower limbs. Cases of this character are relatively rare, and in this statement he seems to disagree with Brissaud, who apparently regarded them as more common than did Dignat. The latter refers to Hallopeau's case, in which all four limbs were contractured, the hemiplegia of the left side having existed since childhood. A cyst was found within the right parietal lobe. He

[1] "Recherches anatomo-path. et phys. sur la contracture permanente des hémiplégiques," par E. Brissaud, Paris, 1880, p. 76.

[2] Arch. gén. de Méd., 1871, p. 449.

[3] Le Progrès Médical, 1883, vol. ii. p. 802.

refers to two similar cases with necropsy, published by Pitres,[1] and to a case published by Féré[2] without necropsy, and reports two cases himself without necropsy.

In one of his cases the patient was eighty seven years of age, and the hemiplegia had existed for a year, and this case shows that bilateral contracture is not confined to those cases in which the hemiplegia develops in childhood.

Marie[3] refers to the contracture of both lower limbs occurring in hemiplegia, but he gives no examples of this except in the picture he borrows from Brissaud's monograph published in 1880.

One of the most recent works on nervous diseases is by Dejerine.[4] He mentions Hallopeau, Brissaud, Pitres, and Dignat as having observed contracture of the "sound" side in hemiplegia, but he gives no references to recent observations on this subject.

Brissaud[5] asserts that contracture is never found in the upper limb on the "sound" side, and my case alone would show that this statement is erroneous.

The explanation for the bilateral contracture in hemiplegia is to be found in the innervation of both sides of the body from each side of the brain. There can be no doubt that each cerebral hemisphere innervates both sides of the body, but the fibres innervating the so-called sound side are fewer in number, and therefore the contracture on this side, when it occurs, is less intense than on the more paralyzed side, and this was the condition in my case.

Von Monakow[6] refers to the remarkable fact that the intensity of contracture need not be proportional to the number of degenerated pyramidal fibres; in other words, that sometimes partial interruption of the pyramidal tract may cause a more intense contracture than complete destruction of this tract. The contracture in partial destruction of the tract is the result of irritation of the remaining pyramidal fibres and of the partial loss of inhibition through degeneration of some of the fibres. Von Monakow accepts the teaching of Exner and Sternberg, that excito-motor ("bahnende") fibres exist in the central nervous system as well as depresso-motor fibres, and by irritation of the former the muscular tonus may be exaggerated and contracture result. The excito-motor fibres are contained in the pyramidal tract, but are not confined to this tract.

The bilateral contracture in my case possibly may be explained by a partial loss of cerebral inhibition, as a result of which the muscular

[1] Soc. de Biol., 1880, and Soc. Anat., 1881.
[2] Archives de Neurologie, 1882, No 10, p. 61.
[3] Vorlesungen über die Krankheiten des Rückenmarkes (translated from the French), pp. 25, 27.
[4] Sémiologie du Système nerveux, p. 486.
[5] Traité de Médecine, p. 41.
[6] Gehirnpathologie, p. 302.

tonus was exaggerated, this exaggeration being also occasioned in part by irritation of the excito-motor fibres. The early age at which the hydrocephalus developed may have aided in the increase of muscular tonicity. The pyramidal tract from the right cerebral hemisphere was only slightly degenerated, and the case is proof, therefore, of the correctness of von Monakow's statement, that partial interruption of the motor tract may cause a more intense contracture than complete destruction of this tract.

The second case that I report was in the service of Dr. C. K. Mills, at the Philadelphia Hospital, and I am indebted to him for the clinical notes and the pathological material. I saw the patient with Dr. Mills many times. The internal hydrocephalus was the result of closure of the aqueduct of Sylvius by proliferation of the neuroglia, and caused the symptoms of cerebellar tumor. The ventricles, except the fourth, were much dilated, the fourth being of normal size.

H. C. was admitted to the Philadelphia Hospital on October 28, 1901. He was a well-developed youth, aged nineteen years. He said that he had had slight headache once or twice a week since he was a child, and each attack of headache was associated with vomiting. About July, 1901, the headaches became more intense, although they did not increase in frequency. The vomiting continued, and he now began to have difficulty in walking. He felt dizzy at times, and staggered like a drunken man. This disturbance of gait came on suddenly, and had persisted. He did not have pain in the eyes, and had always slept well. While lying on his back he occasionally felt dizzy, and the dizziness was relieved by turning on his side.

He had been a constant cigarette smoker, using as many as thirty to fifty cigarettes in a day. He used coffee and tea to excess, and had been a moderate drinker of alcohol. He denied all venereal disease.

An examination made October 30, 1901, gave the following results:

The eyes show some exophthalmos, which patient asserts has always been present. He has always been myopic. The irides react to light and in accommodation. The tongue is protruded straight, and shows slight tremors. No palsy of the muscles of the arms is detected. The grip of the hands is fair. Both knee-jerks are exaggerated, but no ankle clonus is obtained. Slight patellar clonus is present on each side. The muscle-jerks are increased. The Babinski reflex is absent on each side. The station with feet apart is good, but with feet together is poor, and sway is not increased by closure of the eyelids. The gait is unsteady, and at times he has to catch hold of the bed to keep from falling. Sensation to touch and pain seems normal.

Notes by Dr. de Schweinitz are as follows: "The patient has always been myopic. The myopia is between 3 and 4 diopters. In each eye there is well-marked beginning optic neuritis. Arteries about normal in size. Veins are tortuous. On right side a few small hemorrhages down from disk are found. The neuritis is about even on the two sides. Reactions of irides are normal. The form fields are normal. Rotation of eyes is normal. The patient has had double vision."

January 2, 1902. The patient to-night had a slight tremor of the muscles of the arms and face, lasting a few seconds; this was followed by unconsciousness, stertorous breathing, and irregular and rapid pulse. He became cyanotic. The saliva flowed from the mouth, and slight nystagmus of both eyes, lasting about five minutes, occurred during the attack. The pupils were contracted. The pulse at the beginning of the attack was of good tension, but later became very rapid and weak, and stopped about four minutes after cessation of breathing. The pupils became dilated as the pulse became rapid.

The patient died at 7.25 P.M. January 2, 1902. The necropsy was made by Dr. F. J. Kalteyer, January 3, 1902.

Pathological Diagnosis. Œdema and congestion of the lungs; internal hydrocephalus.

On removing the skullcap, which was extremely thin, the brain substance and its membranes bulged outward. On the internal surface of the skullcap the moulding of the convolutions of the brain could be distinctly made out. The third and lateral ventricles of the brain are distended with clear fluid having a specific gravity of 1010. The aqueduct of Sylvius is not patulous.

SUMMARY. The patient, a boy, aged nineteen years at the time of death, had had some headache once or twice a week, with vomiting, since childhood; but about six months before death the headaches became severe, and cerebellar gait was observed. Dizziness was also experienced, especially when the patient laid on his back. This dizziness was probably the result of pressure of the distended cerebral ventricles on the cerebellum. Slight exophthalmos was observed. Distinct optic neuritis was present in each eye. The knee-jerks were exaggerated. Death occurred suddenly.

The skull was very thin—hardly thicker than a sheet of paper at the sides of the calvarium. The cerebral ventricles were much distended, but the fourth ventricle was of normal size. The aqueduct of Sylvius was entirely occluded when examined by the naked eye, but in microscopical sections (Fig. 6) a very small opening was found, which may have been absent during life. It is questionable whether any fluid passed through this opening during life. Small groups of ependymal cells were seen in several places, and these had evidently been separated from the ependymal lining by the proliferation of the neuroglia.

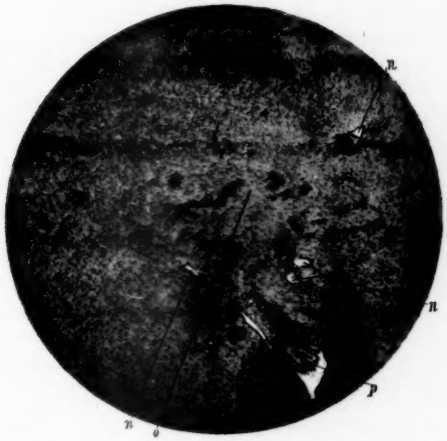
Oppenheim[1] has described a case of myasthenia gravis pseudoparalytica in which he found bridging over of the aqueduct of Sylvius, and in some sections a third canal. Such anomalies of this region he believed had never previously been described. The occlusion in the case H. C., reported by me, must be of the same character as the partial occlusion in Oppenheim's case, and was probably congenital or acquired early, on account of the history of headache and vomiting dating from

[1] Monatsschrift für Psychiatrie und Neurologie, March, 1900, p. 177.

childhood. The occlusion must have become complete about six months before the patient's death, when the symptoms became much more intense than they had been previously. The closure of the aqueduct of Sylvius resembles in the changes of tissue produced by it the condition often seen in the region of the central canal of the spinal cord.

The symptoms were exceedingly suggestive of cerebellar tumor, and in every case where a tumor of this portion of the brain is suspected the possibility of internal hydrocephalus should be borne in mind.

FIG. 6.



Occlusion of the aqueduct of Sylvius, causing internal hydrocephalus of the third and lateral ventricles. The fourth ventricle was not distended. *n*, *n*, *n*. Small masses of ependymal cells from the lining of the aqueduct, cut off by proliferation of the neuroglia. Other similar masses are not included in the photograph. *p*. Lower part of the aqueduct of Sylvius, almost entirely closed by the proliferated neuroglia. *o*. Area where the aqueduct formerly existed. (Case 2.)

This is by no means the first case in which the symptoms of brain tumor were caused by internal hydrocephalus. Byrom Bramwell,[1] some years ago, reported cases in which the characteristic symptoms of cerebellar tumor were present; but a distention of the ventricles, apparently the result of closure of the foramen of Magendie from localized meningitis, was found.

[1] Brain, Spring, 1899, vol. xxii. p. 66.

A CASE OF TYPHOID FEVER, WITH TRICHINOSIS AND EOSINOPHILIA.

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(From the clinic of Dr. Osler, the Johns Hopkins Hospital.)

Trichinosis and typhoid fever have frequently been associated, but most commonly the trichinosis has been in the patient and the typhoid fever in the mind of the physician. The association in the patient of these two diseases appears to be exceedingly rare. In a search of the literature only one instance was found, and this of considerable interest. It was reported by H. Fischer[1] in 1898, although the case had been seen in 1862. This was in a butcher's assistant, aged twenty-four years, who had eaten raw tainted pork. He was taken ill on August 21st with chills, general malaise, etc., and admitted to the hospital on August 27th, with the usual symptoms of typhoid fever. The attack was severe and a bed-sore formed. In the removal of the slough a portion of sound muscle was taken, and in this trichinæ were seen macroscopically. They were also found microscopically. The patient died on October 11th. At the autopsy (von Recklinghausen) very many trichinæ were found in the muscles. The lesions of typhoid fever were also present. In discussing the case Fischer notes that the clinical picture was one of typhoid fever. There was neither œdema nor rigidity of the muscles. Only the accident of the bed-sore made a diagnosis possible during life.

The present case is reported both on account of the rare association of the diseases and as another example of the value of eosinophilia in the diagnosis of trichinosis. Since attention was called by Brown,[2] in 1897, to eosinophilia in trichinosis, a number of confirmatory cases have been published. In the present case the association with typhoid fever and the occurrence of pneumonia during the course are of special interest in connection with the blood-findings. The history is as follows:

Typhoid fever; trichinosis; eosinophilia; typhoid relapse; pneumonia; recovery. T. B., male, aged twenty-three years, German, occupation tailor, was admitted to Dr. Osler's wards on June 4, 1900, complaining of headache and fever. His family history was negative, except that it had been noted that both his brother and himself bled easily and profusely from any cut. In the previous three years he had three attacks of hæmoptysis, but otherwise he had been healthy. He drank but little alcohol. His appetite and digestion were usually good. He had been in the habit of eating raw sausage every week and raw ham occasionally.

His illness began fourteen days before admission, when he noticed some abdominal pain which he referred to the stomach. This became

more severe at the end of a week. He had some diarrhœa, the bowels moving three or four times a day. There was headache and severe pains in the eyes. For a few days before admission he had complained of some pains in the joints. There had been some swelling about the eyes, but none elsewhere. He had not had any nose-bleed. He gave up work three days before admission. None of the others living in the same house were affected as he was.

On admission he was very dull and stupid. The temperature was 103.2° F. The tongue was coated. There was some puffiness of the eyelids, but no œdema elsewhere. No tenderness was found on pressure anywhere over the muscles. There was marked capillary stasis everywhere. The lungs and heart were clear. The pulse was 112 to the minute, soft, and markedly dicrotic. The abdomen was flat. There were numerous rose spots. The respiratory movements were well marked. On palpation of the abdomen there was general tenderness and gurgling in the right iliac fossa. The muscles were tense, rendering palpation difficult, but the edge of the spleen could be felt. The urine was negative, the diazo-reaction was not given. The leucocytes were 11,000 per c.mm., and a differential count showed 65 per cent. of polymorphonuclears and 28 per cent. of eosinophiles. The occurrence of marked eosinophilia being considered in the clinic as suggestive of trichinosis, a piece of muscle was removed from the gastrocnemius. A portion of this was examined fresh, but showed no parasites, and while subsequent stained sections showed some myositis, no trichinæ were found. The Widal reaction was not given.

It was noted in the blood-slides stained with the triple stain that the granules in the eosinophiles were not typical, but were rather in size and staining between the neutrophilic and eosinophilic granulations. In the case of some cells it was difficult to say to which class they belonged. All doubtful forms were classed as neutrophilic. On June 6th a differential count was made in specimens stained with eosin and methylene blue. This gave polymorphonuclears, 48.2 per cent.; mononuclears, 8 per cent.; eosinophiles, 4.38 per cent.

In all the cells classed as eosinophiles there were some typically staining granules, but in many these were comparatively few in number, the majority having only about one dozen typical granules. In addition to these were numerous granules which took on a more or less feeble eosin stain. There was no question as to these cells being eosinophiles. Among the 219 cells, among 500 leucocytes, which were classed as eosinophiles, only *one* was a perfectly typical eosinophilic cell such as one finds in normal blood and such as were later found in large percentage in this case.

The fever persisted, the temperature twice reaching 104° F., but it gradually fell, and for some days varied from 99.5° F. to 102.5° F. There was persistent headache. There was no diarrhœa, and the examination of the stools was negative for parasites. On June 9th the leucocytes were 12,000 per c.mm., of which 39 per cent. were eosinophiles. In specimens stained with triple stain there was still some difficulty in distinguishing between the neutrophilic and eosinophilic granules. On June 10th there was still some puffiness of the eyes, and tenderness was noted over the cervical and calf muscles. There was also some pain in the arms on raising them. Rose spots were still present. Cultures were made from these with negative results. The

spleen was not felt. The tongue was furred. On June 11th the leucocytes were 12,500 per c.mm., and a differential count by Dr. Futcher showed 37 per cent. of eosinophiles. The eosinophilic granules now took on a more typical stain. The fresh blood showed marked eosinophilia, and the eosinophiles were actively amœboid. Dr. Osler saw the patient frequently and discussed the question of diagnosis. He considered that the patient had typhoid fever without doubt. The eosinophilia and other conditions suggested trichinosis, but thus far the results of examinations of the muscles have been negative. On June 14th a positive diazo-reaction was given. Neither albumen nor sugar was found in the urine at any time.

The patient's general condition during this time was good. His temperature gradually came down, touched normal on June 13th—the twenty-third day—and was normal for some hours on the following day. On June 16th he had sudden severe pain in the right side, cough, bloody expectoration, and with these there was a decided change in his condition. Dulness was found over the lower right back, with feeble breath sounds and fine crackling râles with inspiration. The next day a friction rub was heard. The temperature gradually rose, and on June 18th reached 104° F. The next day it was 104.5° F. The sputum contained large numbers of diplococci. The temperature continued at about an average of 103° F. for a week. Without giving the details, it may be said that there were typical signs of pneumonia, first in the lower and later in the upper right lobe. Repeated examinations for tubercle bacilli were negative. The temperature came down very slowly, and it was about three weeks before it reached normal—about the fiftieth day after the onset of the illness. The lung signs had cleared before this, and the condition seemed more like a typhoid relapse, accompanied by pneumonia, than a pneumonia alone. A moderately marked Widal reaction was given on July 7th.

The blood-findings during this time were as follows: On June 15th, at the beginning of the relapse, the leucocytes were 15,250 per c.mm., of which 29 per cent. were eosinophiles. With the pneumonia on June 19th they were 11,500 per c.mm., of which 24 per cent. were eosinophiles, while on June 26th, with consolidation of the lower right lung, the leucocytes rose to 21,700 per c.mm., of which 71 per cent. were neutrophiles, and only 12 per cent. were eosinophiles. On this date aspiration of the pleural cavity was done, but with a negative result. By July 4th the percentage of eosinophiles had fallen still lower, the leucocytes were 16,000 per c.mm., of which 78 per cent. were neutrophiles and 4 per cent. eosinophiles. At this time the temperature was not over 101° F., and the lung signs were clearing. On July 21st the patient was well, the leucocytes were 16,000 per c.mm., of which 17 per cent. were eosinophiles.

Despite the negative results of the examination of the portion of muscle removed from the gastrocnemius, the persistent eosinophilia so strongly suggested trichinosis that before the patient was discharged a second piece of muscle was removed from the biceps. Trichinæ were found in the sections cut from this. The muscle substance showed no signs of myositis except just about the capsules.

The patient was discharged on July 21st in good condition. His subsequent history is of interest, especially in regard to the question as to the duration of the eosinophilia. He was seen on December 26,

1900, and found to be very well and in good physical condition. His blood-count was: Hæmoglobin, 85 per cent.; red corpuscles, 4,800,000; white corpuscles, 6200. The differential count of 500 leucocytes showed: Polymorphonuclears, 78.3 per cent.; small mononuclears, 12 per cent.; large mononuclears and transitionals, 8.2 per cent.; eosinophiles, 1.5 per cent. The stained specimen was normal in every way.

In considering the case there are some points of special interest. 1. The rare association of the diseases, which has already been referred to. 2. The diagnosis of the two conditions. 3. The persistent eosinophilia leading finally to the diagnosis of trichinosis. 4. The influence of the various conditions present on the blood. In reference to the diagnosis on admission, the œdema of the eyes, the eosinophilia, and the characteristic history all suggested trichinosis. The absence of muscular tenderness, the negative findings in the stools, and no trichinæ being found in the portion of muscle removed from the leg, were against it. The general picture was rather one of typhoid fever. There was constant fever, a furred tongue, a palpable spleen, and successive crops of rose spots, all of which spoke for typhoid fever, although at first the diazo-reaction was not given in the urine and the Widal reaction was absent until some time after admission. The question of diagnosis was frequently discussed by Dr. Osler, and the opinion expressed that the patient had typhoid fever, whether or not he had trichinosis. The probability is that had there been only trichinosis present the patient might not have gone to bed. The recent work of Williams[3] has emphasized the degrees of severity of the infection with trichinæ. The present case, with the rather slight symptoms, suggests a mild infection.

There are certain symptoms common to both typhoid fever and trichinosis, especially fever, general malaise, and intestinal features, but attention may be called to some signs which are usually present in typhoid fever and which may also occur in trichinosis, namely, rose spots, enlarged spleen, and the presence of the diazo-reaction in the urine.

Rose Spots. In all the description of trichinosis the frequent occurrence of various rashes is noted, of which, perhaps, miliaria is the most common. The majority of the articles on the disease make no mention of "rose spots," but these have been described in the reports of several cases. Thus, among the cases reported with eosinophilia (which number between twenty-five and thirty) there were five with a rash apparently identical with the roseola of typhoid fever. In all of these, however, the rose spots were apparently few in number, and so far as can be gathered from the descriptions, there was no instance of the appearance of successive crops as in the present case.

Enlarged Spleen. This was noted in six cases out of the series with eosinophilia, but in no instance does it seem to have been marked.

Diazo-reaction. This was present in seven cases out of the series. With so many of the symptoms and signs common to the two diseases, it is little wonder that mistakes should be made. The first impression of a case may be so strong that, provided the course is satisfactory, marked symptoms would be necessary to lead to a revision of the diagnosis. In doubtful cases the value of the blood examination is evident. The presence of the Widal reaction in one disease and the occurrence of eosinophilia in the other are all important. The eosinophilia is of special interest.

Eosinophilia in Trichinosis. Since the first instances published by Brown, in 1897, there have been between twenty-five and thirty confirmatory cases published. The diagnosis has not been confirmed in all the reported cases by finding trichinæ in the excised muscle. But in certain of these the diagnosis was rendered certain by other findings, such as trichinæ in portions of the sausage eaten. It is to be hoped that those reporting cases in the future will always endeavor to render the diagnosis sure by finding the trichinæ in the muscle. The harpoon, so often referred to, is not necessary. A small portion of muscle can be readily removed under cocaine. The lower end of the biceps is probably the best available situation, and, as shown in the present case, trichinæ may be found there, and not in a portion of muscle removed from the gastrocnemius.

There are two reported cases of trichinosis without eosinophilia. In one of these, that of Howard,[4] no count was made during life, although slides were examined, and there was no evident eosinophilia. A second is reported by Da Costa,[5] in which, with a leucocyte count of 12,000 per c.mm., there was only half of 1 per cent. of eosinophiles. Repeated examinations showed practically the same result. The portion of muscle examined showed large numbers of trichinæ, and it was also noted that it was rich in eosinophilia cells. While such exceptions show that eosinophilia in trichinosis is not of invariable occurrence, still it occurs so frequently as to be a sign of great value. This is well shown in the present case, as, but for the persistent eosinophilia, the diagnosis of trichinosis would not have been made.

In the present case the leucocytosis was not specially high. The greatest number of leucocytes—21,700 per c.mm.—occurred during the attack of pneumonia. The highest percentage of eosinophiles was 43.8, which was found two days after admission. The blood-counts are given in tabular form—in the first the leucocyte counts with the percentage of each variety, and in the second the relative number of each variety per cubic millimetre.

TABLE I.—LEUCOCYTE AND DIFFERENTIAL COUNTS.

Date.	Leucocytes per c.mm.	Polymorphonuclears.	Small mononuclears.	Large mononuclears and transitionals.	Eosinophiles.
June 4	11,000	65	3.4	3.6	28
" 6	11,000	48.2	4.5	3.5	43.8
" 9	12,000	51	5	4.7	39
" 11	12,500	54.4	5.4	2.5	37.2
" 15	15,250	60	6.4	4.6	29
" 19	11,500	67.4	9	9.6	24
" 26	21,700	71.2	11	5.5	11.9
July 4	16,000	78.6	15.5	1.4	4.5
" 14	18,000	57.7	14.5	5.7	22.1
" 21	16,000	65.1	13.8	4.4	16.7
Dec. 26	6,200	78.3	12	8.2	1.5

NOTE.—The typhoid relapse began on June 15 and the attack of pneumonia on June 16th. The temperature reached normal on July 10th.

TABLE II.—LEUCOCYTE COUNTS WITH THE ABSOLUTE NUMBER OF EACH VARIETY OF LEUCOCYTE PER CUBIC MILLIMETRE.

Date.	Leucocytes.	Polymorphonuclears.	Small mononuclears.	Large mononuclears and transitionals.	Eosinophiles.
June 4	11,000	7,150	374	396	3080
" 6	11,000	5,302	495	385	4818
" 9	12,000	6,120	600	564	4680
" 11	12,500	6,800	675	312	4650
" 15	15,250	9,150	976	701	4372
" 19	11,500	7,751	1035	1074	2760
" 26	21,700	15,450	2387	1193	2582
July 4	16,000	12,576	2480	224	720
" 14	18,000	10,386	2610	1026	3978
" 21	16,000	10,416	2208	704	2672
Dec. 26	6,200	4,854	744	508	93

In considering these counts the occurrence of typhoid fever and pneumonia has to be kept in mind. That the former influenced the relative numbers of the various forms is doubtful; certainly no increase is to be noted in the large mononuclear forms, which, perhaps, might have been looked for when the usual increase of these in typhoid fever is remembered. It will be noted that throughout the number of polymorphonuclears per c.mm. never fell below normal (which may be put as about 5000). The change during the attack of pneumonia is marked. There was both a relative and absolute increase of the polymorphonuclear neutrophiles which continued while the patient was under observation and after the lung had cleared. The small mononuclears were at first much below normal, but gradually increased and reached normal with the onset of the pneumonia. With this they increased much beyond normal, and remained so until the patient was discharged. The large mononuclears and transitionals showed much the same course, and they also increased markedly with the pneumonia. There was a curious drop in their number on the count of July 4th, with which

there was no special change in the patient's symptoms or condition, and on the next count they had again risen. Rapid variations in the differential counts of the blood of patients with trichinosis have been frequently noted, and there may even be marked differences found between daily counts. The eosinophiles were increased throughout, both in percentage and in absolute number. The influence of the attack of pneumonia is striking. With the onset of this and an increase in the polymorphonuclears, the eosinophiles decreased, and by July 4th, when the former were at their highest percentage, the eosinophiles were low. By July 14th, when the pneumonia was over, the polymorphonuclears had fallen and the eosinophiles again risen in number. The same influence of an intercurrent pneumonia on eosinophilia has been noted in other conditions than trichinosis. Thus, Ehrlich and Lazarus[6] note that in a case of ankylostomiasis, with 72 per cent. of eosinophiles in the blood, these fell to between 6 per cent. and 7 per cent. during the febrile period of an attack of pneumonia, rising after it to 54 per cent.

The ratios between the different varieties of leucocytes agree with the findings of Brown in his cases. He found that the mononuclears showed but slight fluctuations, while there was an inverse relationship between the neutrophiles and eosinophiles, an increase of eosinophiles occurring with a decrease of neutrophiles. There are not many records of an intercurrent pneumonia with which to compare. In one of the cases reported by Blumer and Neuman[7] complicated with pneumonia, a count taken at the time of the crisis showed 8000 leucocytes per c.mm., of which 33.6 per cent. were eosinophiles Subsequent counts gave much the same percentage.

Lastly attention is to be drawn to the staining characteristics of the cells in this case. When the patient came under observation the first differential count was made with specimens stained with the Ehrlich triple stain. It was at once noted that there were a number of cells which in their staining seemed between normal neutrophiles and eosinophiles. The staining of many of the granules in cells which were evidently eosinophilic was not as brilliant as is the case in normal cells. There was no doubt in the majority of these cells that they were to be classed as eosinophiles, and in making the counts any cell about which there could be any question was classed as a neutrophile. It could almost be said that there were all grades of variations between typical neutrophiles and eosinophiles, although the great majority of the cells were more eosinophilic than neutrophilic. There were in the majority of these cells a certain number of granules which took on a typical eosinophilic stain. This was better brought out in specimens stained with eosin and methylene blue, with which practically all of these "intermediate" cells showed a certain number of

typically staining eosinophilic granules of ordinary size—but many had not more than a dozen of these—while the granules, which with the triple stain took on only a partial acidophilic stain, showed only a faint color from the eosin solution. These atypical granules were between the ordinary neutrophilic and eosinophilic granules in size. In fresh specimens they looked like typical eosinophilic granules, and the whole cell had the appearance of an eosinophile. They were actively amœboid. By June 19th the Ehrlich triple stain was taken much more sharply, and there were very few of these "intermediate" cells. After this date there were practically none, and all of the eosinophiles were typical. Atkinson[8] found much the same condition in his case. There were cells apparently between the neutrophiles and eosinophiles. In some the granules were larger than the ordinary neutrophilic granules, but lacked the typical eosinophilic staining. Other granules were of the normal size of the neutrophilic ones, but took a more brilliant stain, while some of the eosinophilic granules did not have the typical size, but took the acid fuchsin stain well. One week later he noted that there was less difficulty in distinguishing between the neutrophiles and eosinophiles. His observations are much like those made in the present case.

The question arises as to the significance of these leucocytes containing granules between those of the normal neutrophilic and eosinophilic cells. Do they speak for the derivation of eosinophilic from neutrophilic cells? In his studies of the changes in the muscle in trichinosis, Brown noted that at first there were cells found which suggested transition stages between neutrophiles and eosinophiles. On later examination it was found that these cells had diminished in number, but there were more typical eosinophiles present. These atypical cells were not found in the circulating blood in his cases, as in Atkinson's and the present case. They appear to be only of very occasional occurrence in the circulating blood in trichinosis. One explanation for their appearance is that they are cells such as Brown found in the muscle, which, for some reason, have been swept into the blood-current. Subsequent examinations showed them to be diminished both in the blood in these cases and in the muscle substance in Brown's case, while in both at the same time the number of typical eosinophiles had increased. This may be interpreted as supporting the possibility of the transition of one variety into the other. The inverse ratio found between the relative numbers of eosinophiles and neutrophiles may be used to support the same view. In a case such as the present one, however, with the marked influence on the relative varieties of leucocytes due to the attack of pneumonia, one is rather inclined to accept the explanation of chemotactic action. The increase in the neutrophilic cells commonly seen in pneumonia is probably best explained by this theory. The increase in the number of eosinophiles in cases with

an intercurrent pneumonia may be due to chemotactic action, which while positive for the neutrophiles is negative for the eosinophiles. Such an explanation might be given for the inverse ratio between the eosinophiles and neutrophiles observed in uncomplicated trichinosis.

In conclusion, emphasis may again be placed on the value of eosinophilia as a means of diagnosis in trichinosis. It was only on account of the persistent eosinophilia that the diagnosis was made in the present case.

References.

1. Fischer, H. Deut. med. Wochenschr., 1898, vol. xxiv. p. 821.
2. Brown. Journal of Experimental Medicine, 1898, vol. iii. p. 315.
3. Williams. Journal of Medical Research, n. s., vol. i. p. 64.
4. Howard. Philadelphia Medical Journal, 1899, vol. iv. p. 1085.
5. Da Costa. Clinical Hæmatology, 1901, p. 435.
6. Ehrlich and Lazarus. Die Anaemie, 1898, p. 113.
7. Blumer and Neuman. American Journal of the Medical Sciences, 1900, n. s., vol. cxix p. 15.
8. Atkinson. Philadelphia Medical Journal, 1899, vol. iii. p. 1243.

FECAL IMPACTION IN TYPHOID FEVER, WITH REPORT OF CASES.

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Fecal impaction is not mentioned as a complication or sequela of typhoid fever in any of the text-books on medicine,[1] and yet, while a rare condition, it is not so uncommon as to warrant its omission from consideration in both categories.

Perhaps the difficulty in drawing the line of definition between marked degrees of constipation and the condition of fecal impaction has led to the classification of many cases among those of extreme constipation when in reality they had passed the dividing line.

Cribb, writing in the *Australasian Medical Magazine*, speaks of fecal impaction as a common complication of typhoid fever in New South Wales, and expresses surprise at the lack of reference to it in text-books. He also reports several cases with fatal results.

Brannan, in his article on typhoid fever, in the *Twentieth Century Practice*, states that constipation more often calls for treatment than diarrhœa, also that he regards diarrhœa as beneficial, "an effort of nature to rid the system of poisonous matter," but makes no mention of fecal impaction.

Melville, in writing of intestinal conditions in typhoid fever in India, places diarrhœa as the symptom of most importance in determining

[1] Musser in the third edition of his "Physical Diagnosis" mentions fecal impaction as a complication.

prognosis. To quote his own words: "The more severe and the more persistent the diarrhœa the worse the prognosis. The converse I hold to be almost equally true, viz., the more persistent the constipation the better the prognosis." Some authorities state that they have never seen constipation do any harm. In cases of fecal impaction in typhoid fever when not due to foreign bodies, gallstones, etc., the progress to that condition has, of course, passed through the stage of constipation, and in that event constipation may be the cause of much harm. If, as is not uncommon in these cases, the impaction be accompanied by signs of diarrhœa, producing a condition we might speak of as concealed constipation, then Brannan's estimate of diarrhœa as an effort of nature to rid the system of poisonous material is particularly applicable.

Of the cases about to be cited, three occurred in the wards of the Pennsylvania Hospital, one under the care of Dr. F. A. Packard, and two under my care while substituting for Dr. Lewis and Dr. Scott. A fourth case occurred in my term at the Church Home for Children, Angora.

In Case I. the impaction extended from the anus far up into the large intestine, and could be palpated externally as a series of hard masses. At no time was there any distention of the abdomen. The fecal masses almost blocked up the lumen of the bowel, were exceedingly hard, and adhered to the intestinal mucosa, so that in dislodging those within reach of the finger some hemorrhage would follow and small fragments of the mucous coat would be brought away. So adherent and packed together had these fragments become that in order to get rid of them we were compelled to mine them out by means of a uterine curette, the process being assisted by enemata of sweet oil. After two days of this treatment the lower bowel within reach was fairly cleansed, and with enemata and purgatives the whole intestinal tract was finally relieved. The condition was overlooked for some time, as the case was apparently doing exceedingly well at the end of a mild attack of typhoid fever, the bowels were regular, moving every day or every other day, the abdomen was not distended, and it was not until after repeated small hemorrhages of bright fresh blood occurred, with scanty bowel movements, that suspicion was directed to the cause, and rectal examination revealed the condition.

In Case II. the impaction occurred early in the third week. The patient's abdomen became greatly distended, the pulse and respiration rapid, and the temperature reached 105.4° twice in twenty-four hours. The bowels had been loose since the onset, and generally moved twice daily. The only cause which could be assigned for the condition was overdosing with milk. A new nurse had taken charge of the case a few days before the onset of the bad symptoms, and had given the child six fluidounces of milk every two hours night and day. Calomel in divided

doses was given, and on the following day I received a small box, carefully wrapped up in wax paper, containing a lump of hard casein and a note stating that the child's condition was greatly improved after several enormous evacuations of lumps similar to the one enclosed, and that the reason for sending this particular lump was that the matron thought it was "sprouting."

Cases III. and IV. are quite alike, and the bowels were moved after repeated small enemata, there being difficulty in getting the nozzle of the syringe in the rectum to any distance until by degrees the masses were brought away in small quantities.

CASE I.—F. R., aged fifteen years, paperhanger, admitted to the Pennsylvania Hospital July 17, 1897. Previous history, no typhoid, pneumonia, malaria. Present illness, three days ago had severe headache, compelling him to stop work. Slight nose-bleed. Had since grown worse with fever, headache, diarrhœa, and weakness. Temperature, 104° on admission.

July 26th. The note states that a small quantity of blood was passed without a bowel movement. On August 1st he again passed some bright red blood.

August 2d. Rectal examination made and rectum found to be full of hard fecal masses intimately attached to the mucosa. Curetted out. Large clay-colored lumps came away, and those that could not be brought away were loosened. Enemata of oil given.

5th. Has been passing the lumps by degrees. None can now be felt.

7th. Seems to have passed all the lumps. Temperature normal. No more blood; no pain in bowel movement.

17th. Discharged cured.

CASE II.—E. S., aged seven years. Pupil. Admitted to Infirmary May 8, 1899. Had been sick several days, with loss of appetite and headache. Temperature, 101° on admission.

May 12th. Temperature shows typical typhoid variations, reaching 104° at night, and falling to 101° in morning.

19th. Temperature reached 105.6°. Abdomen much swollen and tympanitic; pulse rapid, expression anxious. No very great tenderness in abdomen. Calomel ordered and quantity of milk reduced.

20th. Large quantities of lumps were passed in several bowel movements. Temperature lower; abdomen less distended and general condition much improved.

June 1st. Temperature has reached normal.

10th. Uninterrupted convalescence.

CASE III.—S. S., aged twelve years. Was admitted to the Pennsylvania Hospital on July 23, 1901, with the following history: One brother and one sister are already in the hospital with typhoid fever. Patient has never been ill before. Present illness began three days before admission, with headache, diarrhœa and slight cough. Marked anorexia; no epistaxis

Examination. Poorly nourished child. Tongue heavily coated; pulse of good volume. Temperature, 103.4°, respiration 24, pulse 112 on admission. Heart and lungs were negative. Abdomen soft and flat; liver normal; spleen slightly enlarged; no rose spots present.

No tenderness anywhere. Remainder of physical examination negative. Widal reaction the day after admission was negative. Four days later Widal was suggestive, and temperature reached 104.4° F., not having been below 100° F., although frequent sponges given.

On August 2d, ten days after admission, Widal was positive, and rose spots appeared. From this time on till August 19th, the thirtieth day, the disease ran an uncomplicated course, the only fact of interest being that the bowels never once moved without the aid of an enema, given every other day. On the 19th patient complained of some pain in the abdomen, and screamed with pain when an enema was given and bowels moved, the movement consisting of a very small, hard mass. On examination of the abdomen the following condition was noted:

Child very fretful and irritable; temperature 99.4° F., respiration 24, pulse 92. On right side of abdomen, parallel to Poupart's ligament and about two inches above it, can be felt a number of irregular masses in the ascending colon, extending for a distance of four inches. The masses are not tender, are movable, and can be indented on pressure. On left side, on deep palpation, a few smaller masses can be felt above the sigmoid flexure. The abdomen is slightly distended, but nowhere tender. Rectal examination reveals a quantity of doughy, fecal masses, not adherent to the mucous membrane, but considerably distending the rectum. An enema containing an ounce of glycerin was given, and was followed by a very large stool resembling putty in color and consistency. Several looser stools followed, and convalescence was uninterrupted and uneventful.

Case IV.—M. G., aged twelve years, admitted to the Pennsylvania Hospital on August 4, 1901, with the following history: Family history negative; past history, had scarlet fever when a small child; since then, healthy. Present illness: had been sick six days previous to admission. Began with headache and anorexia, general malaise and feeling of weakness. Had two attacks of epistaxis. Bowels have been very loose all week. Has had a slight cough; no chills.

Examination. Well-nourished child, face slightly flushed. Faint icteroid tinge of scleræ. Tongue very dry and coated along dorsum; pulse somewhat accelerated. Slight tremor of hands; temperature 104.2° F., respiration 24, pulse 120 on admission. Heart and lungs negative. Abdomen round, soft and not tender on palpation. Liver normal; splenic dulness considerably increased; one or two suspicious spots present. Three days after admission a positive Widal was returned, and a number of rose spots appeared. Leucocytes, 5000. From this time until August 22d, the twenty-fifth day of the disease, course was mild and uneventful. At this time the patient complained of difficulty and pain at stool, and the temperature, which had been almost normal for several days, rose to 103.2° F. Examination of abdomen revealed the following condition:

A hard accumulation of feces occupies the lower bowel, especially the ascending colon. The lumps can be easily felt through the abdominal wall, and are slightly doughy on pressure. Castor oil was administered, and an enema given containing one-half ounce of glycerin. This treatment resulted in a few hours in the evacuation of a large quantity of hardened feces, followed by two loose stools, after which the temperature rapidly fell again, and thenceforward convalescence was rapid and uneventful.

[N. B.—Previous to the impaction reported the patient's bowels, while exhibiting a tendency to constipation, were always moved once in forty-eight hours, often without the assistance of enemata.]

The question of the etymological definition of fecal impaction is rather unsettled. The author has assumed impaction to exist where, from adherence of feces to the bowel or from mutual pressure of masses of feces, the lumen of the intestine is either narrowed or completely obstructed.

Dr. F. A. Packard remembered having seen four cases of fecal impaction in typhoid fever, three presenting masses in the left iliac fossa, evident on inspection, while the fourth was a case similar to Case I. in this paper, the feces likewise being quarried out with instruments. The points the author wishes to make are that this condition of fecal impaction is not so uncommon as the paucity of the literature on the subject would lead one to suppose. Second, that diarrhœa may accompany impaction, and thus divert suspicion from the real state of affairs. Finally, that overdosing of milk, especially in the case of children, is an important etiological factor.

UPON AN EXTENSIVE OUTBREAK OF FOOD INTOXICATION AND INFECTION OF UNIQUE ORIGIN.[1]

(ABSTRACT.)

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During the three days succeeding November 29, 1897, 118 male and 100 female inmates of the Ohio Hospital for Epileptics, at Gallipolis, became acutely sick and took to bed. A number of other inmates were also affected by the prevalent illness, but not confined by it. The resident patient population of the institution at that period was 607.

The illness manifested itself by the following symptoms: chilliness, especially up and down the spine; cold hands and feet; aching limbs; severe headache, with sense of pressure; nausea, and vomiting in some cases; profuse watery diarrhœa; pain in abdomen, especially about umbilical region, griping and cramps with soreness of abdomen; dizziness and staggering gait; fever and prostration. The pulse was accelerated 100 to 120 beats a minute; the fever averaged 102.5° F.,

[1] Read by title, March 29, 1902, at the second annual meeting of the American Association of Pathologists and Bacteriologists, Cleveland, Ohio.

persisting at least four days along with the diarrhœa. A number of victims were severely prostrated. None died.

Food-poisoning was suspected as the cause of this wholesale sickness, and an investigation[1] was at once instituted.

Suspected food articles, like milk, butter, and apple-butter, were immediately examined, with negative results. It soon developed that the illness was exclusively confined not only to the patients, but to those male and female patients, 506 in number on the morning of November 29th, eating in the central general dining-rooms. The officers, employés, and a group each of male and female patients (those in the two "closed" cottages), with separate dining-rooms and kitchens, were spared. This circumstance confirmed the negative laboratory findings relative to the milk, butter, and apple-butter, and made it possible to eliminate a number of other articles which, like meat, vegetables, canned goods and breadstuffs, were used in common throughout the institution. Evidently, then, some article of diet peculiar to the central dining-room for male and female patients was at fault.

By a process of exclusion, suspicion finally came to rest upon the oatmeal used for breakfast November 29th. It was learned that at this period all the oatmeal for the patients' central dining-rooms was cooked in a single large batch in the steam-table of the serving-room adjoining the dining-room for females. It was customary to steam the oatmeal all afternoon, turning off the steam at 6 o'clock P.M., by which time the batch had gradually cooled, reaching the body heat about 9 or 10 o'clock. Before breakfast the oatmeal was warmed by turning on the steam for a short time.

Certain peculiar conditions existed in the serving-room containing the steam-table in question. There was no provision for the escape of the clouds of steam issuing from the table while in operation, except through doors and windows; consequently, the steam arose to the high ceiling of the room and condensed. During the dry summer preceding the outbreak, quantities of dust from the then unpaved road, the main thoroughfare of the institution, entered the adjacent double doors and windows of the serving-room and collected on the ceilings dampened twice a day by the steam and vapor of cooking. That the bacterial inhabitants of the dust were thus exposed to favorable vegetative conditions seems quite plausible.

Now the effect of this moisture on the ceiling was to gradually loosen the plaster of which it was composed, and it eventually became necessary to replace a considerable portion of it. Accordingly, at 9 or 10 o'clock on the evening of November 28th, 600 square feet of plaster

[1] This study was pursued by the writer in the Pathological Laboratory of the Ohio Hospital for Epileptics. Clinical data were furnished by Drs. Richard O'Connell, W. G. List, and S. J. Webster, assistant physicians at the hospital.

over the steam-table were knocked off and new plaster laid. In the steam-table were three large pans, with loosely-fitting tin lids, containing 20 gallons of partially cooled oatmeal, for breakfast on the 29th. The top of the steam-table was covered with a layer of paper sheets and one of rubber sheets. This protection sufficed to keep the coarse masses of plaster out of the oatmeal, but did not prevent the sifting in of the fine plaster dust which filled the room in a cloud and insinuated itself everywhere. At this time the temperature of the batch of oatmeal was about that of the body heat (incubator heat), and this was largely maintained through the remainder of the night by virtue of the covering over the table. To these peculiar circumstances the outbreak of food-poisoning and infection was ascribed after all other reasonable possibilities had been excluded, on the assumption that the oatmeal had become contaminated by the bacteria-ladened dust from the ceiling, the micro-organisms multiplying in the warm oatmeal as in a culture medium and producing their toxic products.

Laboratory confirmation of the conclusion reached as just stated was apparently afforded by the following experiments:[1]

EXPERIMENT 1. Scrapings from an intact portion of the original ceiling adjoining the newly-laid surface, and ground bits of plaster, obtained with bacteriological precautions, were used to inoculate tubes and flasks of bouillon. This contaminated bouillon became diffusely cloudy and *foul in odor* after twenty-four hours' incubation.

EXPERIMENT 2. Plate cultures from the contaminated bouillon yielded predominating numbers of two bacterial species, one fully identified as *B. coli communis*, and the other a putrefying, liquefying, non-chromogenic, gas-producing, motile bacillus of the *proteus* group, probably *Proteus vulgaris*.

EXPERIMENT 3. *B. coli* and *Proteus vulgaris* were also isolated in plate cultures prepared from suspensions of the plaster dust in bouillon.

EXPERIMENT 4. Three guinea-pigs subjected to intraperitoneal injection of 0.5 c.c. to 1 c.c. of the twenty-four hours' bouillon mixed culture contaminated with plaster dust died in twenty-four to thirty-six hours of septic peritonitis.

EXPERIMENT 5. Finally, oatmeal prepared as for consumption by the usual cooking was inoculated with scrapings from the ceiling and incubated overnight. Portions of this oatmeal fed directly to cats and rabbits produced no noticeable effects. From the bulk of the oatmeal an extract was prepared by the Stas-Otto method, yielding a small quantity of a yellowish, oily fluid. A few drops of this fluid administered by the mouth to three cats produced a rise of temperature (2° F. or 3° F.) within half an hour, and vomiting in one in fifteen minutes. In another of these animals a diarrhœa persisting for two days was set up. In the third fibrillar tremor, rapid breathing, convulsions, and opisthotonus followed in half an hour after the administration of a drop

[1] At this time (December 3d) it was too late to obtain any of the original oatmeal, and the patients had so far recovered as to render a bacteriological examination of the vomitus impossible.

or two of the ethereal extract. A batch of oatmeal like the first, but not contaminated with plaster dust, was treated similarly, and its extract used as a control, with no effects.

A CASE OF CHRONIC INTERSTITIAL PANCREATITIS, WITH INVOLVEMENT OF THE ISLANDS OF LANGERHANS IN A DIABETIC.

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In 1900 Szobalow[1] reported two cases of diabetes, with chronic interstitial pancreatitis, in which he could find no trace of the islands of Langerhans, but the credit of the first systematic study of the relations of the finer microscopical lesions of the pancreas to diabetes mellitus is due to Opie,[2] who in January, 1901, reported a series of cases in which the concurrence of glycosuria and lesions of the islands of Langerhans of the pancreas was very plainly shown.

Opie's first paper was quickly followed by a second report,[3] and then by communications by Wright and Joslin,[4] Weichselbaum and Stangl,[5] Herzog,[6] and M. B. Schmidt.[7]

Each observer has in turn reviewed the work of his predecessor, which it is unnecessary to give here in detail. A "Critical Summary" upon the subject, by the writer, recently appeared in the *Philadelphia Medical Journal*.[8] However, a brief review and classification of the recorded cases may not be out of place.

There have been reported in all thirty-five cases of diabetes in which autopsy showed an atrophy of the pancreas which involved the islands of Langerhans, and in which other causes of pancreatic atrophy were absent. In none of them could any other reason for the existence of glycosuria be discovered.

Of the six papers referred to, those of Opie and of Weichselbaum and Stangl are much the most important. They have described three distinct types of lesions in such cases.

1. An atrophy of the pancreas affecting the secretory glandular epithelium, but much more intensely the islands of Langerhans. These bodies show evidence of cellular degeneration and are diminished in number. There is an increase in the connective tissue, both interlobular and interacinar, which Weichselbaum and Stangl hold to be secondary to the atrophy of the epithelium. All other causes for the existence of the atrophy are absent in these cases, and there is much to suggest some factor specific to diabetes. The centro-acinar cells described by Opie are increased, perhaps, as Weichselbaum and Stangl

suggest, secondarily to increased tissue activity. The fat droplets described by Stangl in the normal pancreas are more numerous, both in the secretory epithelium and in the islands of Langerhans, but probably the increase is but relative, due to atrophy. The zymogen bodies described by Stangl are increased in number, probably for the same reason.

2. Hyaline degeneration of the islands of Langerhans first described by Opie. The process appeared to commence in the capillaries, destroys the islands, and sometimes involves the glandular tissues adjacent. These hyaline bodies began peculiar staining reactions, and have been described by Wright and Joslin as well.

3. A chronic interlobular and interacinar interstitial pancreatitis in which the islands have been involved apparently rather late in the process, as the result of the excessive proliferation of the connective tissue. In this variety the islands appear to resist the fibrous invasion quite vigorously, and the secretory glandular epithelium is in a much more advanced stage of degeneration than the cells of the islands of Langerhans. The occurrence of glycosuria in this type is usually less pronounced.

4. Schmidt has also described a case of acute diabetes in a boy, aged ten years, in whom there was an acute inflammation of the pancreas involving the islands of Langerhans.

The classification of the thirty-five reported cases is as follows: (This includes that of the writer.)

I.	Atrophy confined to or greater in the islands . . .	24 cases.
II.	Hyaline degeneration of the islands	6 "
III.	Chronic interstitial pancreatitis with secondary and late involvement of the islands	4 "
IV.	Acute necrotic destruction of the organ, involving the islands	1 "

Various theories have been advanced to explain the relation between the islands of Langerhans and the sugar-consuming function of the pancreas. The most prominent of these is that the islands secrete some substance to the blood which influences the assimilation of carbohydrates. This is supported by the work of Szobalow, who found that after feeding dogs with carbohydrates the islands of Langerhans became granular, and also by the fact that when the pancreas is totally removed glycosuria results, while in the intense atrophy of the pancreas following the ligation of its duct, the islands of Langerhans are never involved, and glycosuria is absent. Owing to the intimate relation between the islands and the rest of the pancreas, experimental work upon these bodies alone is almost impossible, and the study of the subject must be carried on by the collection of cases of pancreatic diabetes. Consequently it is of extreme importance that all cases of

so-called pancreatic diabetes should be put on record, and this has been the incentive to publish the case that follows.

The patient was a German, aged seventy-two years, a shoemaker by occupation. He suffered from acute articular rheumatism at thirty years of age and again at fifty years. Following the last attack there was dropsy of his legs. He had had epileptiform attacks, beginning ten years before death, and occurring every month or so, for a period of eight years.

His appetite was fairly good, and thirst was not immoderate. The first record of a urinary examination occurred in 1894, and from that time until June, 1900, there was polyuria and glycosuria. The amount of urine passed in the twenty-four hours varied from 75 ounces to 135 ounces, and contained from 3 per cent. to 6 per cent. of sugar. He died July 20, 1900.

The autopsy showed a small area of tuberculosis at the apex of the right lung. Atheroma of the mitral and aortic valves; fatty degeneration of the myocardium; general arterio-capillary sclerosis; chronic interstitial nephritis and hepatitis; an atrophic condition of the gastric mucous membrane, and some dilatation of that organ.

The pancreas was hard, and even to the naked eye presented evidences of the increase in fibrous tissue. There was no obstruction in the ducts. Pieces were taken for microscopical examinations from six places at more or less regular intervals from the head to the tail. They were hardened in the formol-Müller fluid and the sections were stained by hæmatoxylin and casein, Ribbert's phosphomolybdic acid-hæmatoxylin stain, and ammonia carmine.

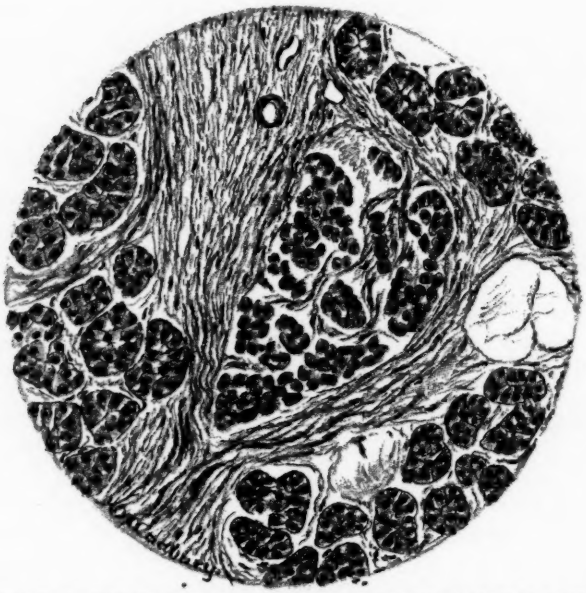
The sharpness of the microscopical pictures was obscured by digestive changes, which in some places were quite advanced. Good differentiation was hard to obtain by hæmatoxylin, and ammonia carmine gave a better result in the study of the nuclei. Examination showed first a very marked increase in the connective tissue of the glands. The sclerosis affected the whole organ equally, and was of the interlobular as well as the interacinar type. The connective tissue separated the acini, pressed upon their cells, and in some places had apparently caused their entire destruction, and had taken their places by the formation of broad bands of fibrous tissue in which are embedded the islands of Langerhans and remnants of the much degenerated acini.

The cells of the parenchyma presented changes that range from irregularity of the nuclei and loss of staining power to total degeneration and disintegration. The ducts were usually surrounded by considerable fibrous tissue, and were apparently unaltered.

The islands of Langerhans appeared to be diminished in number when compared with sections from the same portion of the pancreas of a case of syphilitic interstitial pancreatitis of much the same type, but

without involvement of the islands. The average size of the islands is rather less than in the second case. Many of them present no decided change, and invasion of connective tissue cannot be demonstrated. In other places the cells of the islands appear to be crowded, the nuclei are closer together, and the protoplasm is less prominent, giving the impression that the cells are compressed. Certain portions of these islands show invasion by connective tissue, which appears to follow the capillaries. This invasion varies in degree. Perhaps the

FIG. 1.



Section from near the tail of the pancreas, showing an island of Langerhans invaded by fibrous tissue and with some cellular degeneration. The interacinar type of the chronic interstitial inflammation is well shown. Stained with ammonia carmine. Leitz, oc. 3, ob. 5.

most pronounced example is found in Fig. 1. Here the cells are crowded and their protoplasm is diminished, while in places their nuclei are irregular and stained very deeply, indicating some digestive process. In other islands the fibrous invasion appears merely as spindle cells and delicate bands running between the epithelial cells.

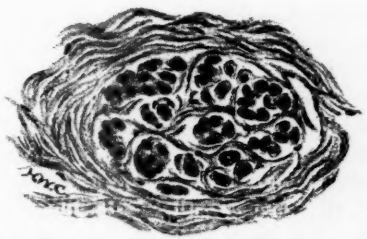
Ribbert's phosphomolybdic acid-hæmatoxylin stain demonstrates these fine fibrous trabeculæ very plainly (Fig. 2). Nowhere were the hyaline changes observed by Opie present. The tissue was too much affected by digestive changes to determine definitely the proportion of

the centro-acinar cells described by Opie, or to study the fat droplets in the epithelial cells described by Weichselbaum and Stangl. The small arteries were much thickened. The new-growth of connective tissue affected particularly the intima.

The case may be classified as an instance of chronic interstitial pancreatitis of the interlobular type which had become interacinar as well.

The islands of Langerhans are diminished in number and size, a certain proportion of them are invaded by fibrous tissue, causing compression and a certain amount of degeneration of their cells. In some of the islands the involvement is quite pronounced, in others Ribbert's stain is needed to demonstrate the invasion of the fibrous tissue. These changes are associated with very advanced degeneration of secretory

FIG. 2.



Section from near the tail of the pancreas, showing a slight invasion of an island which lies in an area of dense fibrous tissue in a greatly degenerated portion of the gland. Phosphomolybdic acid-hæmatoxylin stain. Leitz, oc. 3, ob. 5.

glandular epithelium, and the involvement of the islands of Langerhans must be considered distinctly less severe than that of the secretory portion of the glands.

The case here reported, morphologically at least, belongs to the form referred to as chronic interstitial pancreatitis with secondary and late involvement of the islands of Langerhans. The secretory epithelium is in a far more advanced state of degeneration than are the islands of Langerhans, but the latter are decidedly involved and probably reduced in number.

Clinically, however, the case is a well-marked one of diabetes mellitus extending over a period of at least six years. The findings suggest that the indurative or interlobular interstitial pancreatitis may be associated with cases of diabetes as typical clinically as those that occur with that form of atrophy attributed by Weichselbaum and Stangl to a specific cause, and in which they suppose the process attacks the islands of Langerhans earlier and more severely.

REFERENCES.

1. Szobalow. Centralblatt für allg. Path. und Anat., 1900, vol. xi.
2. Opie. Journal of Experimental Medicine, 1901, vol. v., No. 4.
3. Opie. Ibid., 1901, vol v., No. 5.
4. Wright and Joslin. Journal of Medical Research, November, 1901, vol. i.
5. Weichselbaum and Stangl. Wiener klinische Woch., October 10, 1901.
6. Herzog. Transactions of the Chicago Pathological Society, November, 1901.
7. M. B. Schmidt. Münchener medicinische Woch., January 14, 1902.
8. Steele. Philadelphia Medical Journal, February 1, 1902.

HYPERTROPHY OF THE LYMPHOID TISSUE AT THE BASE OF TONGUE AS A CAUSE OF COUGH.[1]

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COUGHS, especially those reflex in character, so annoying and so distressing to the patient as to call for treatment, often tax the skill and patience of a physician. While these may be due to various causes, I wish to call your attention to one which, while not entirely new, yet is usually overlooked by the general practitioner. In fact, it is only the very recent text-books that touch upon the subject in any definite manner.

I allude to those due to hypertrophy of the lymph tissue at the base of the tongue, of the lingual tonsil, or the lingual adenoid, as it is variously termed. This tissue is situated at the base of the tongue between the circumvallate papillæ and the epiglottis, and is sometimes at the sides in continuity with prolongations from the faucial tonsils. To inspect it, the laryngoscope must be placed a little higher and further forward than when viewing the larynx. Normally we see a few small, irregular elevations on the back of the tongue, but the mediogloss-epiglottidean ligament and the fossæ on either side are quite visible. It is superimposed upon a firm base of solid muscular tissue, fasciculi from which run into its substance and interlace between its crypts, and is sparingly supplied with bloodvessels.

When this tissue becomes hypertrophied it is seen to more or less fill up the glosso-epiglottic fossa and to encroach or impinge upon the epiglottis, perhaps touching its laryngeal surface, and producing various symptoms. Sometimes bloodvessels become varicose, forming, as Lennox Browne termed them, "lingual hemorrhoids," but these are usually associated with some systemic disturbance.

The symptoms due to the chronic hypertrophy are: feeling of foreign body in the throat, loss or impairment of singing voice, huskiness, radiating pain in the ear and chest, tickling and feeling of fulness in

[1] Read before the Harlem Medical Association.

the throat, dysphagia, vomiting, glottic spasm, and, lastly, the one considered in this paper—cough.

This cough may be a short, hacking one, an irritating or exasperating one, one of violent paroxysms, or of a croupy, barking nature, and is accompanied by no expectoration.

Of the following twelve cases all but four showed no other abnormality; the cause of the trouble being the enlargement of this mass of tissue. The results of treatment were very gratifying.

Case I. is of special interest, as tuberculosis was feared.

Case I.—Rhoda H., aged fifteen years, Detroit, Michigan. Family and previous history negative until she was ten years old, when she was affected with hip disease, right side, and had, also, pain in the knee. Plaster casts were employed, and in six months she was pronounced cured. She had pneumonia four years ago, being confined to her bed for three or four weeks, and was compelled to be under treatment for four months following.

In September, 1898, she was taken with a croupy cough, accompanied by paroxysms of choking, and from time to time with complete loss of voice. The young lady was compelled to discontinue her studies. Various methods of treatment were tried, but without avail. From her history a tubercular taint was suspected. In June, 1899, she called at my office, complaining of these paroxysms and of loss of voice. I found her a fairly well-nourished girl. The examination of the lungs was negative. In the vault of the pharynx there were a few small masses of hypertrophied lymph tissue not enough to cause obstruction. The larynx was normal. The epiglottis was somewhat prolonged and buried itself on phonation in a marked hypertrophy of the lymph tissue at the base of the tongue. On watching her I found that only when the epiglottis tried to free itself would the paroxysms occur.

The hypertrophied lymph tissue in the pharyngeal vault, although small, was removed under an anæsthetic administered by Dr. M. Schiller.

The patient was allowed a rest of about two weeks. As the paroxysms still continued the hypertrophic tissue at the base of the tongue was removed with Myles' lingual tonsillotome, several sittings being required for the purpose. The patient had aphonia follow, but the voice soon returned and the cough completely stopped.

She has been thoroughly well since, as I have received several letters from her, the last about a month ago. Rice gives a very interesting description of a similar case.[1]

Case II.—Miss S., aged forty-two years, consulted me in May, 1897, for a hacking cough, for which she had received anodyne cough mixture, inhalations, tablets, etc., with no relief. Examination of the chest negative. Nose, slight deviation of septum to left, but no obstruction to breathing. The lymph tissue at base of tongue was thickened and raised so as to fill the glosso-epiglottic fossa. I advised operation, but this was refused, and so applied a solution composed of iodine crystals, ℥j; potass. iodide, ℥j; glycerin, ad. ℥iv; ol. menth. pip., q. s. ad. to flavor, at three different times, causing a shrinkage of the growth, with relief from the symptoms. Cough reappeared in February, 1898, and

[1] New York Medical Record, May 1, 1886.

same treatment was applied with same good result. Since then the patient had returned with the same trouble three times, the last time being two months ago, being each time cured with the same applications.

CASE III.—Miss B., aged twenty-nine years, referred by Dr. H. Bernstein, complained for several months of a scratchy feeling in the throat, causing a short, dry cough. In the morning blood-streaked expectoration would appear. Examination of chest negative. Throat examination revealed hypertrophic lymph tissue at base of the tongue, touching the epiglottis at the sides. Operation not consented to. These were treated with the iodine solution at six different sittings within a short period. She has had thus far no return of the cough or bleeding.

CASE IV.—Miss Pauline S., aged thirty-five years, consulted me in 1898 for a hoarse cough caused by an irritation in the throat. Examination showed slight hypertrophy of the lymph tissue at the base of the tongue. This was touched up with the iodine solution—as she would not submit to an operation—several times, and the symptoms disappeared. Since then the symptoms reappear about twice yearly, and disappear again with the same treatment.

CASE V.—Miss G. S., aged sixty-three years, came under my care at the Manhattan Eye and Ear Hospital, complaining of constant cough, of a dry, hacking nature. Examination revealed a double uvula, one limb of which rubbed slightly against the faucial tonsil of the left side, and a large hypertrophy of the lymph tissue at the base of the tongue at the right side. The extra uvula was removed, and the patient requested to report back in two weeks. Examination then showed the wound completely healed, but no diminution in size of the lymphoid hypertrophy, and, as the symptoms continued, this was removed, with Myles' lingual tonsillotome, with complete cure.

CASE VI.—Mrs. C. G., aged fifty-nine years, was referred by Dr. I. Heller, because she complained for the four past months of a sensation as of a pin sticking in her throat, causing an irritating short cough. Examination showed only a one-sided hypertrophy of the lingual tonsil. This was removed with the lingual tonsillotome, with complete relief to the patient.

CASE VII.—Mrs. E. R., aged twenty-seven years, consulted me for a cough, coming, as she said, from her throat. Upon examination an evenly distributed, marked hypertrophy of the lingual tissue was seen touching the epiglottis. Auscultation revealed bronchial breathing and in the sputum tubercle bacilli. Upon explaining the nature of the trouble, she still desired something done. With the lingual tonsillotome, from time to time, extending over a period of one month, I removed some of the hypertrophic mass. While she still coughed, yet, as she said, her throat felt better and the hacking was only half as much. I lost all trace of her one month later.

CASE VIII.—Mr. M. S., aged thirty-two years, has had a cough for the past year, but for the past four weeks constant in character. The middle portion of the lingual tonsil was enlarged, presenting two small masses. These were snared off with the cold wire, with complete cessation of cough, or, as the patient expressed it later, "cured as if by magic."

CASE IX.—James E. C., aged forty years, complained of a hacking cough which he had for nine months. Examination revealed only the

lingual hypertrophy, two small masses on the left and three on the right side, all touching the epiglottis. These were touched up with the galvanocautery at a red heat, cocaine having been previously applied. There was very slight reaction, and in a week the resulting pain had disappeared with the cough.

Case X.—Miss M. R., aged nineteen years, whom I treated at the Manhattan Eye and Ear Hospital, complained of a croupy cough for the past two years, which was then getting so bad that she was hoarse all the time. She felt something sticking in her throat, and cough would come on. Examination showed a marked deviation of septum to right and hypertrophy of the lymph tissue at base of tongue. I removed this mass with the tonsillotome, and the cough ceased. About one month later I straightened the septum by the use of the saw. About three weeks ago the patient reported she was perfectly well.

Case XI.—Mr. H. S., aged thirty-six years, referred by Dr. Bernstin, complained of a dry cough. Examination showed lingual adenoids, to which—as he refused any operative procedure—I applied the iodine solution. The patient also had an exostosis of the septum, left side. He left town the next day, but later I learned from his doctor that he was much improved, the cough having materially lessened.

Case XII.—Mrs. F. W., aged thirty-four years, consulted me, saying that for the past twelve months she had been troubled with irritation in the throat, making constant attempts at clearing it and suffering from hoarseness and cough. Upon examination I found a marked hypertrophy of the lingual tonsil and a slight trachomatous nodule on the left vocal cord. With a tonsillotome I removed all the hypertrophic tissue. Patient reported one month ago that the cough had stopped, but that she was still hoarse. I have not seen or heard from her since.

In concluding this paper, I will say many patients present hypertrophied lingual tonsils without giving any undue symptoms. The cure affected with cases reported could hardly be ascribed to the psychical effect of the treatment. Eight of the cases presented no other trouble. The tubercular case showed a marked relief.

The after-treatment consists of antiseptic sprays, pieces of ice, cocaine spray, or lozenges in case of pain, which is usually of short duration. The food should be mild and soft. The hypertrophies can be removed by chemical caustics, astringents, silver nitrate fused on a probe, and iodine solution in the way of drugs. Instruments employed can be any of the tonsillotomes, curved scissors, cold snare, or the heated one, galvanocautery knife to burn off, to puncture, or the flat electrode to pass over the whole growth. These last must be used at a red heat. In using the chemicals, caustics or cautery, care must be taken to avoid injuring the epiglottis. The cold snare is only effective in the flabby granulations, otherwise the scissors must be used to divide the mass embodied in the snare, on account of the connective-tissue fibres. In my hands Myles' lingual tonsillotome has been the instrument giving the best results, and, as you have seen, the cutting instruments give the only complete cure.

The hemorrhage caused has been very slight in every instance, except in the case of the deviated septum when it poured forth for a few minutes, but it stopped without any interference.

To render a diagnosis positive, an application of 5 to 10 per cent. of cocaine applied to the hypertrophy will stop the symptoms, except, perhaps, in those cases where the epiglottis buries itself in the mass.

A CLINICAL LECTURE ON GOITRE.[1]

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REPORTED BY FRANCIS D. PATTERSON, M.D.

The first patient exhibited to you to-day is a man, aged thirty-two years, who was sent to us from Ohio. By occupation he is a presser. His father died at the age of fifty-seven years because of a complication of diseases; his mother died at the age of sixty-seven years from pneumonia. One brother, when twenty-seven years of age, perished as the result of an accident. Three brothers and three sisters are living and in good health. You will observe, therefore, that no fact becomes evident in the family history which bears even indirectly upon this patient's disease.

He had an attack of scarlet fever when five years of age, and also had typhoid fever in childhood. Three years ago he had an attack of malaria. During the past ten winters he has suffered from repeated attacks of influenza, which have had the effect of making him weak, nervous, despondent, and generally miserable.

Some seven months before admission the patient began to feel completely tired out. He felt, he tells us, like a man who had worked day and night without rest. No matter how long he remained in bed he was unable to get rested, and arose tired, morose, and depressed. He became extremely nervous, and noticed that his limbs trembled and that his hands shook. He had great difficulty in sleeping, his appetite failed, and even slight exertion rendered him breathless and caused his heart to beat violently.

In the month of May, 1901—*i. e.*, five months before his admission to this institution—he observed that there was an enlargement in his neck. This has continually increased in size until the present time. In July, three months before admission, he observed that his eyes were becoming prominent, the projection of the right eye being more evident

[1] Delivered at the Jefferson Medical College Hospital.

than that of the left. He says that the eyes looked as if they were too large to move in their sockets. A heavy, aching pain in the brow and eyeballs was almost continually present. This pain was much worse on getting up in the morning than on going to bed at night.

During the few weeks preceding his admission into this hospital his appetite returned, and, strange to say, became ravenous. He was unable to satiate it, and had cravings for extraordinary articles of diet. These, when obtained, failed to satisfy him. His mouth and throat constantly felt dry.

We may sum up the history as follows: A man in the third decade of life, whose health had been shattered by repeated attacks of influenza, developed a train of distressing nervous symptoms, among which were mental depression, tremor, cardiac palpitation, dyspnœa on even slight exertion, and insomnia. After suffering for a number of weeks from these nervous symptoms, an enlargement appeared in the neck, the eyeballs became prominent, the appetite returned, but as a capricious and ravenous appetite, and most persistent headache became a factor in the case.

Let us investigate the present condition of this patient. There is a very marked enlargement in the thyroid region, which all of you can see. It is symmetrically developed on each side of the neck, each portion being the size of a duck's egg. The enlargement is certainly the thyroid gland, or is connected with the thyroid gland, as it presents the important sign of a thyroid tumor, viz., during swallowing it rises up and descends with the larynx and trachea. Of course, this sign is not absolute proof that a tumor is thyroid, but it is very suggestive. In rare instances a non-thyroid tumor will rise and fall with the larynx and trachea—for instance, some of the congenital cysts of the neck will do so; but if a tumor that does this is not a thyroid tumor it is either high up in the neck and near the hyoid bone, or a demonstrable, malignant growth with infiltration, or an inflammatory process with adhesions. The mobility of the symmetrical enlargement before us, its situation and its history are conclusive evidence that it is not inflammatory or malignant, and that it is thyroid.

When we look closely at the swelling in the neck we observe that it seems to pulsate. If I lay my hand upon this enlargement I feel a moderate thrill. By listening with the stethoscope I am able to detect a systolic murmur. The pulse is extremely rapid, running from 120 to 140 per minute. The apex-beat of the heart is very forcible. The man himself is thin, pallid, and anxious-looking. He is extremely tremulous. The tremors are quite rapid and are noted even when the patient is at perfect rest. They are most marked in the hands.

The eyeballs protrude very markedly. When we direct the patient to turn his eyes downward toward the floor we notice that the upper

eyelids are immovable; this symptom is known as Graefe's sign. Furthermore, when we ask him to close his eyes it looks as if they do not close completely, a certain amount of white still being visible. The ophthalmologist reports that the visual apparatus is entirely normal.

Every few days the temperature of this man reaches 100° F., without obvious cause, and then again sinks to normal; and whenever he has the elevated temperature he has also a profuse sweat. The symptom which disturbs him the most, however, is the dyspnœa, which is at times so severe as to make him fear that he is suffocating. When it comes on he is unable to lie down. He sleeps poorly, is much depressed mentally, and of late the very poor appetite is again complained of. The urine report shows that the fluid is turbid, amber-colored, acid, and of a specific gravity of 1024; and that it contains no albumin, no sugar, 2.5 per cent. of urea, amorphous urates, squamous epithelium, and a few short granular tube-casts.

It is evident from the symptoms which I have set forth to you that this patient is laboring under that interesting and remarkable disease known as Graves' disease, Basedow's disease, and exophthalmic goitre —a disease characterized, particularly in typical cases, by rapid pulse, exophthalmos, and thyroid enlargement; although any one of these factors may be absent. In fact, early in the case, as was noted in this man, two of these elements may be wanting.

Graves' disease does not seem to bear any relation to ordinary goitre, for it is not more frequently met with in the districts in which ordinary goitre is endemic than in those in which ordinary goitre is unknown. In some cases the symptoms come on with great rapidity, constituting what is known as acute exophthalmic goitre. In an acute case there is furious tachycardia, great protrusion of the eyeballs, and exhausting vomiting and purging, and death is apt to occur in the course of a few days. Such cases have been reported by Lloyd, Potts, and others. The case before us, however, is of the chronic type, and is consequently less dangerous. This form of the disease may follow upon overwork, either physical or mental; anxiety and worry, or certain acute maladies. In this patient influenza seems to have been the exciting cause.

Exophthalmic goitre is rare in children, is extremely rare in old age, is most frequent in adults, and is more common in females than in males. Its essential cause is involved in obscurity. There are three well-known theories as to its cause. One view is that it is due to some malady of the central nervous system—a view that finds support in the observation that emotional disturbances are often influential in the production of the affection. Another theory is that some disease of the cervical sympathetic is responsible. This view probably originated from the supposition that the goitre of Graves' disease is largely pro-

duced by dilatation of the bloodvessels; but, as a matter of fact, and as Mr. Berry insists, it is not caused in that way; for the goitre contains fewer bloodvessels than are met with in the ordinary goitre, and even these are of smaller size. The sympathetic theory entirely lacks demonstration. The view which finds the most advocates is that the thyroid gland is itself diseased and is furnishing too much thyroid secretion, or an altered secretion having a peculiar toxic character; and that the symptoms are, to a great degree, dependent upon the toxic action of the internal secretion of the thyroid gland. This is known as the theory of hyperthyroidization, and is the most generally accepted view.

The hyperthyroidization theory gains probability from the fact that by the administration of thyroid extract to an individual who has not exophthalmic goitre, toxic symptoms can be produced which resemble the symptoms met with in Graves' disease; and that by giving it to an individual with exophthalmic goitre the symptoms are made worse. But when we remember that Graves' disease can exist without thyroid enlargement, that the removal of the thyroid gland may not cure it, and that purely emotional causes may produce it, we must fall back upon the theory that we are dealing with a malady of the central nervous system, which, in most cases, by an unknown method, causes enlargement and altered secretion of the thyroid gland, and that this morbid secretion is the secondary cause of various toxic symptoms.

The next point to be considered is: What shall we do for this man? Shall we perform an operation, or shall we undertake to treat him medically? Before reaching a conclusion we must first bear in mind that operations, whatever their nature, frequently fail to cure Graves' disease. Often an operation will cure the goitre but will not cure the other symptoms. This is so well recognized that in the average case we advise operation only when some particular necessity which imperatively demands it arises. The very contradictory views which exist as to the cause of this condition should make us conservative in advising an operation, for the nature of the procedure which we should recommend must depend upon our idea as to the causation of the disease.

Further, in reaching a conclusion as to the advisability of operation we should remember that exophthalmic goitre is, in some cases, cured by rest or by the administration of drugs; and that in rare instances it disappears spontaneously after a shock to the nervous system or after an operation upon a distant part of the body performed for some other trouble. Again, operation is more dangerous than in common goitre, and sudden death may occur during its performance or after its completion. For these reasons it is wise, in the majority of cases, to employ medical treatment; but if that fails to cure or to ameliorate, and if the symp-

toms are urgent, then the advisability of an operation must be considered.

The surgical procedure which is usually undertaken is a thyroidectomy; not a complete but a partial thyroidectomy. The complete removal of the gland would probably lead to the development of that curious disease myxœdema. Partial thyroidectomy is the operation to be preferred unless the goitre is very small, the nervous symptoms being the predominant factors; or, unless the goitre is very large, in which case the operation is exceedingly dangerous. If the patient is in an extremely hysterical condition, such a severe procedure is inexpedient. As a matter of fact it has been found that when an exophthalmic goitre is very large, thyroidectomy relieves the patient of the thyroid enlargement, but does not cure the symptoms. If it is quite small it is evident that thyroidectomy is unnecessary; and if the hysterical element is well marked, the operation is generally perfectly useless. What I want to render clear to you is that thyroidectomy is not to be performed simply because a person has an exophthalmic goitre. It is not to be thought of in many cases, and is, after all, to be applied to but certain forms of the disease.

Another operation which has of late attracted a great deal of attention is the bilateral resection of the cervical sympathetic ganglia. This procedure is founded upon the view that exophthalmic goitre results from a disease of the sympathetic system. The operation is, as yet, of but doubtful value. It is a pure experiment. Cures have been reported as following it, but it is difficult to determine whether these cures have resulted because of the definite curative tendency of this particular operation, or because of the general effect of the operation, *per se*, a point to which Dr. J. William White has particularly directed attention. Jonnesco maintains that many cures can be obtained by this procedure, and asserts that it produces a sclerotic change in the thyroid gland. The theory that the operation saves the heart from the excessive stimulation of an irritated sympathetic does not seem sufficient to justify its performance, when we recall that the sympathetic theory of causation has been abandoned by most neurologists. If this operation does produce benefit, it probably acts by causing a hyperæmia of the brain, and thus preventing those attacks of vasomotor constriction which arise during the progress of exophthalmic goitre. The true status of the procedure is uncertain. It is not free from danger, and takes some time to perform. As a matter of fact, reports indicate that at least some of the symptoms are improved by it; but the permanency of the results is not as yet determined. Wölfler suggested tying the four thyroid arteries, but experience shows that this procedure may be followed by tetany or myxœdema. Kocher ties three of the arteries, and in some cases this seems to be a useful operation.

In the case of the patient before us we will, for the present, at least, reject operation, and undertake treatment by medical means. In the first place, we will insist upon rest, perfect rest—rest in bed, and nothing less than this. Rest is of the first importance in every case. In addition we will apply an ice-bag over the thyroid gland. The application of cold is frequently found to relieve the distress of the disease. An ice-bag over the heart is a valuable means of controlling the too great activity of the circulation.

Under no circumstances will we give thyroid extract in this case. In exophthalmic goitre thyroid extract aggravates the symptoms and makes the patient definitely worse. Many physicians employ digitalis; others use belladonna; and still others pin their faith to electricity. Probably the most useful agent is suprarenal extract, which is one of the most powerful drugs known for raising the blood pressure. The initial dose should be one grain three times a day, and the amount should be gradually increased until the patient is taking four or five grains three times a day.

If this man's circumstances permitted of it we would advise his removal to the highlands or even to a mountainous region where medical treatment could be applied. Such a change often gives great relief and favors cure. Some of these patients recover and never suffer again from the disease; some recover but develop fresh attacks; many get better, but do not completely recover; many more go from bad to worse, and finally die. The prognosis is always uncertain.[1]

The next patient, whom I now show you, also has an enlargement of the neck, and this enlargement likewise affects the thyroid gland. Yet the disease is not the same, and the state of affairs is vastly different from that prevailing in the former case. This patient is a single woman, aged seventeen years. Her father was an Italian, and died of a cause unknown to her. She had a brother who died of diphtheria at the age of four years. Her mother and two brothers are living and in good health. There is no family history of either tuberculosis, malignant disease, or of enlargement of the neck.

The patient had an attack of typhoid fever when eleven years of age. Her menstruation began at the age of fifteen; it has always been regular, and is never painful. About one year ago she observed for the first time a lump on the anterior part of her neck extending on both sides of the median line and situated about an inch and a half above the sternum. Nervous symptoms were absent, and there was no tremor, no cardiac palpitation, and no exophthalmos. For about a month she noticed that this enlargement was daily increasing; then it

[1] This man was greatly benefited by treatment, and returned to his home after being much improved, but not cured.

seemed to become stationary for several months, at the end of which period it again began to increase. At the termination of the first four or five months after the appearance of the lump it had attained the size of a large walnut. Menstruation had no effect in adding to its size. She herself noticed that the tumor moved up and down during the act of swallowing.

About four months before admission to this hospital she observed that the growth was becoming more noticeable, the swelling seeming to increase on both sides of the neck; but it is said to have been slightly larger on the right side. Its increase in size was rapid, and the mass became so large that it began to produce uncomfortable pressure and to interfere with respiration. Because of her discomfort she came to the out-patient surgical department, where I saw her with Dr. Spencer.

At that time both lobes were enlarged, the right side being slightly larger than the left; but there was not sufficient difference to suggest the presence of a cyst of any size. We placed this patient upon a course of thyroid extract and used local inunctions of the red iodide of mercury. For a short time—but only for a short time—the growth of the tumor seemed to be arrested. The patient then became so uncomfortable that I advised her to come into the hospital and submit to an operation.

You will observe that a large mass now extends across the anterior portion of the neck—a mass which is bilateral and fairly symmetrical. It is regular in contour and elastic to the touch; it does not fluctuate, is free from pain and tenderness, and moves up and down with the larynx and trachea on swallowing. There is absolutely no projection of the eyeballs; there are no nervous phenomena; there is no tremor of the hands. Upon a hasty examination it would seem as if the tumor pulsates; but a careful investigation shows that the pulsation is transmitted from the carotid artery. Several large veins are distinctly visible over the goitre, and one of these veins is the anterior jugular.

The patient is short of breath, even when quiet, and suffers from a great deal of dyspnœa on exertion. Every now and then she has violent seizures of coughing, the cough being metallic in tone. The voice is not at all affected. In view of the metallic nature of the cough and the absence of trouble with the voice, we conclude that the dyspnœa results from pressure upon the trachea and not from involvement of the recurrent laryngeal nerve. This form of dyspnœa is the kind met with in innocent goitre; dyspnœa due to involvement of the recurrent laryngeal nerve is apt to be met with in malignant goitre. Swallowing is not interfered with in this patient; in fact, dysphagia is rare in innocent goitre. The pulse is rather rapid, running up to about 90; but not nearly so rapid as was the pulse of the previous patient, which, you will remember, was from 120 to 140.

The case before us is an instance of ordinary goitre. It is a parenchymatous goitre, a simple goitre, or, as some have called it, although not quite accurately, an hypertrophy of the thyroid gland. It is very common in the valleys which are at the foot of certain mountain ranges in Switzerland, in Southeastern France, in Northern Italy, in the Tyrol, in the Himalayas, and in the Andes; in fact, in the regions mentioned it is often so common as to be endemic. It is an enlargement which very frequently forms the basis of other forms of goitre; for instance, an adenomatous growth might take place in either lobe of this gland, or multiple adenomatous growths might form, the condition in either case being adenomatous goitre; or an adenoma might undergo cystic degeneration, the case being then known as cystic goitre. Of course, an adenomatous goitre may begin as an adenoma in an apparently healthy gland; but, not unusually, it begins as an adenoma in a parenchymatous goitre. The adenomatous goitre and the parenchymatous goitre are most common in the same sorts of people and in the same regions. In England goitre is so common in a certain locality that it is called the Derbyshire neck.

There are many theories as to its causation. It is evidently due to the introduction of some poisonous element into the system. What that element is is in doubt. Some think that an individual becomes liable to the disease because of his habits of life. Some think hygienic surroundings create susceptibility. Some attach great importance to hereditary influence. The probabilities are that a poisonous element is introduced in the drinking water. Some observers have blamed snow water; many have blamed water impregnated with the salts of lime. The real reason is wrapped in obscurity.

Such a goitre as we see before us begins insidiously; grows slowly; occasionally ceases to grow for a considerable period, or even shrinks; frequently undergoes temporary enlargement during menstruation or pregnancy; and occasionally attains an enormous size by a change into a cystic form. It is in a case of parenchymatous goitre that medical treatment is often extremely serviceable; in an adenomatous or a cystic goitre medical treatment is perfectly useless. It is in parenchymatous goitre that the iodides internally are frequently useful. The local use of red iodide of mercury has come to us strongly recommended from India. The treatment which is of the greatest value, however, is the administration of thyroid extract.

Several years ago in this clinic-room I suggested the view that in some cases of simple goitre the gland enlarges and becomes distended with colloid, because the human body is calling for more of the secretion of the thyroid gland than the normal gland is able to furnish; as a consequence, the normal gland enlarges its capacity and increases its output. It undergoes a species of hypertrophy in order that it may

furnish the required amount of secretion; it undergoes what John Hunter would call an enlargement under "the stimulus of necessity." It does exactly what an accessory thyroid does when the thyroid gland is completely removed; hence, if thyroid extract is administered by mouth, the demand upon the gland ceases, the output of the gland is lessened, and the enlargement passes away. This may be the explanation of the cures which have followed the administration of thyroid extract; but it will apply, after all, to but few cases; for as we see the disease in this country in cases of sporadic goitre few of them are really markedly improved by the administration of the drug. Occasionally, however, one is greatly benefited by the treatment; and in parenchymatous goitre we always give it a trial.

If medical treatment fails, shall we operate? I believe definitely that we should. We are justified in operating if the goitre is rapidly or steadily increasing in size, or if it is producing dyspnœa, marked discomfort, or annoying deformity. If it is producing marked pressure, operation is imperatively necessary. In the girl before us pressure effects are manifested. The pressure effects in her case are dyspnœa, a metallic cough, and distention of the veins; and we, therefore, advise operation.

Beyond thirty years ago the operation was only occasionally performed, and was extremely fatal; but the introduction of hæmostatic forceps and of antiseptic surgery made the operation comparatively safe and caused it to be largely performed, especially in countries in which goitre is endemic. Reverdin, Kocher, and Socin became particularly noted as operators. These surgeons showed the world that the operation can be rapidly and successfully performed.

Kocher, more recently, has demonstrated that in many cases of goitre, if there is dyspnœa the administration of ether or chloroform adds to the danger.

If the patient is given a general anæsthetic the already large veins become larger, and the hemorrhage met with during the operation is greatly increased; furthermore, during the operation, if the patient is unconscious from the anæsthetic, dangerous pressure may be made upon the trachea, and the recurrent laryngeal nerve may be injured. In most instances—certainly in all cases in which there is a distinct dyspnœa—it is advisable to use merely a local anæsthetic. If the local anæsthetic is carefully inserted the operation can be performed with very trivial pain, and the hemorrhage will not be great; furthermore, by asking the patient to speak from time to time, we can tell by the change of the voice when we are approaching or are touching the recurrent laryngeal nerve. I shall, therefore, operate on this case with merely the aid of a local anæsthetic. I shall use Schleich's fluid for the skin and superficial tissues, and a 2 per cent. solution of eucaine for the deeper parts.

Many operations have been suggested for the cure of goitre. In cystic goitre tapping has been used by many, or tapping followed by the injection of iodine or alcohol; but tapping is uncertain and unsafe, and in a solid tumor of this description would be absolutely useless and very dangerous.

Some surgeons have advised the injection into the enlarged gland of various materials; for instance, tincture of iodine, iodoform emulsion, Fowler's solution of arsenic, alcohol, etc. In such a method the hope is that the injection of these irritant materials will lead to the formation of fibrous tissue, which tissue will contract and cure the goitre; but injection is probably more dangerous, and is certainly less satisfactory, than radical operation; and although a cure may occasionally be produced, many deaths have occurred.

Ligature of the thyroid arteries finds some advocates. This operation was introduced by Wölfler, but at present it is practically restricted to the treatment of exophthalmic goitre. When the operation was first employed the custom was to tie all four arteries of supply; but it was found that this exposed the patient to the dangers of tetany and myxœdema, so, at the present time, if the operation is employed, the surgeon takes Kocher's advice, and ties but three of the arteries.

Occasionally, when the patient is in a desperate condition, when the goitre is very large, when we are certain that a radical operation would be productive of death, and when a tracheotomy is impossible, the operation known as exothyropexy may be performed. In order to perform this operation make a large incision, exposing the capsule of the gland, pull the goitre itself—or, at least, a part of it—out of the wound, and leave it exposed to the air. This dislocation of the goitre relieves the dyspnœa, and may be followed by atrophy of the gland.

Some surgeons have advised a simple division of the thyroid isthmus —an operation which may relieve the dyspnœa and may produce glandular atrophy; but it is uncertain and often of no avail.

The two operations most in vogue are enucleation and extirpation. Enucleation is an operation frequently practised in cystic goitre and in adenomatous goitre, but it cannot be performed in parenchymatous goitre, which is the nature of the case before us. In enucleation a circumscribed tumor or cyst which lies within the thyroid gland is removed from within the gland, the capsule of the thyroid being incised over the tumor, but not being taken away, and hemorrhage being disregarded until the enucleation has been completed. Intraglandular enucleation is the proper term for this process, and it is an extremely satisfactory method for suitable cases.

Extirpation is the removal of the gland and the capsule, after the arteries of supply have been ligated and divided. In the case before

us there is a uniform enlargement of the thyroid, not a circumscribed tumor or cyst within it. Enucleation is, therefore, not to be considered, and extirpation will be performed. Those of the class who wish to understand these operations more thoroughly should read Kocher's *Operative Surgery* or Mr. James Berry's admirable work upon *Diseases of the Thyroid Gland*—a work which I have found of the greatest service in understanding this subject.

We place the patient upon a table and fasten a screen of sterile cloth below her chin. This screen preserves the wound from infection and prevents the sufferer from observing the hemorrhage or any other occurrence of the operation. I now carefully infiltrate the skin with Schleich's fluid in the line of the purposed incision. This incision is the shape of an incomplete horseshoe, the convexity of which is downward. It begins at the inner border of the sternocleidomastoid of the right side, passes down along the anterior margin of that muscle until it reaches a point just above the clavicle; it is then taken inward above the suprasternal notch, and is finally carried upward for a short distance. The first incision passes through the skin, the superficial fascia, and the platysma myoid muscle. Several large veins are found to have been cut, and we proceed to ligate them with care.

Step by step we divide layer after layer, carefully infiltrating the tissue in advance of us with Schleich's fluid; and if any pain is complained of by the patient, we now and then use a 2 per cent. solution of eucaine instead of Schleich's fluid. In this case it is impossible to separate widely enough the muscles which are attached to the hyoid bone. We therefore divide them high up, leaving stumps sufficiently long to permit of subsequent suturing.

The utmost care is employed to definitely expose the capsule of the gland, in order to be sure that we are really down upon the capsule. We do not want to break through this smooth layer of tissue, and we observe the very large veins which are visible beneath it. If these veins be torn the hemorrhage will be very difficult to arrest, because the thyroid substance and the veins always tear when an attempt is made to apply an artery clamp.

We now separate the capsule from the parts outside of it, dissecting with much care and clearing the upper portion of the gland, where we find the superior thyroid vessels. I tie the artery and then the vein with two ligatures each and cut between the ligatures. The gland is now stripped toward the median line, and the veins met with in that situation are tied and cut.

Next the lower portion of the goitre is cleared and the inferior thyroid vessels are ligated. It is just at this point that the recurrent laryngeal nerve is met with. As I feel around in these tissues with the handle of the knife I ask her how she feels; she answers, "It hurts

some," and you notice the modification in her voice, proving that I am in the immediate neighborhood of the nerve.

The goitre is now lifted from its bed and brought out of the wound —in other words, it is dislocated, and the dyspnœa under which she has been laboring up to this time is at once relieved. After the complete dislocation of the goitre the inferior thyroid vessels can be tied with the utmost ease. They are tied close to the border of the gland in order to avoid the recurrent laryngeal nerve, and are then cut across.

We now work inward toward the isthmus and expose and ligate the isthmus before it is cut. Every care must be taken to prevent the colloidal material of the gland from entering the wound. If it does enter the wound it will produce symptoms. These symptoms may be trivial, consisting simply in rapid pulse and some elevation of temperature (thyroid fever); or they may be very grave, and death may actually ensue from a poisonous dose of this material. The isthmus is cut through with a knife. A little oozing is found at one place, which is quickly arrested by the application of a ligature.

The goitre has now been removed; and there has been very little hemorrhage and almost no pain. The patient has scarcely uttered a sound during the operation; she has not spoken a word, except in answer to questions; and, although no one has been holding her hands, she has never even raised them.

We are, therefore, justified in believing that this operation has been practically free from pain.

I now suture together the muscles which were transversely divided, using catgut as a suture material; insert a medium-sized drainage-tube in the lower angle of the wound; suture the skin and superficial tissues with interrupted sutures of silkworm-gut; and apply a plentiful dressing of sterile gauze. The under layer of the gauze must be fluffed up, so as to make a certain amount of pressure, and thus keep the sides of the wound in contact. The outer layers are laid on flat. The bandage which I apply runs around the forehead, the neck, and the shoulders, and thus prevents undue movement, and maintains a certain amount of pressure.[1]

[1] This patient made an excellent recovery. During the first twenty-four hours there was considerable oozing of blood; and, in consequence, the drainage-tube was removed, and a small piece of gauze packing inserted instead. The day after the operation the temperature was 100°; but it soon fell to normal, and remained so. The pulse was decidedly rapid for several days—from 90 to 110.

ORBITAL ABSCESS ASSOCIATED WITH ANTRAL AND ETHMOIDAL DISEASE.

By Charles A. Oliver, A.M., M.D.,
and
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On June 21, 1901, Dr. S. P. Glover, of Altoona, Pennsylvania, sent a thirteen-year-old school-girl to Dr. Oliver's clinic at Wills Eye Hospital. The patient gave a history of rather severe toothache in the left upper jaw for some time before the appearance of a pronounced pain in the left eye, which had come on about six weeks previous to the primary examination. These symptoms were followed in a few days' time by a swelling of the lids of the left eye, protuberance of the left eyeball, diplopia, and divergent strabismus. A few days later vision with the affected organ was reduced to the ability to see to count fingers at six feet distance. At this time a thick, yellowish discharge began coming from the left nostril, accompanied with considerable obstruction to nasal breathing; this continued for a period of three weeks, and was followed by a dropping of very offensive mucopus from the posterior nares.

The swelling of the eyelids soon subsided, revealing the presence of a hard mass in the anterior part of the lower inner portion of the orbit. Vision with the left eye also began to improve, while that with the unaffected right eye began to grow worse. There was a history of attacks of recent moderate delirium, though the appetite was good, the patient slept well, and there were not any headaches, nausea, or vomiting. No history of traumatism except an injury to the back of the head, the result of a fall from a wagon when the patient was seven years of age, could be elicited.

The patient was admitted to the wards of the hospital for careful study of the conditions and operative interference.

There was a left proptosis, which carried the summit of the cornea to a distance of 3 millimetres in advance of that of the other eye. The left eyeball was turned down to 2 millimetres' distance and out. The movements of the globe were impeded with a resultant diplopia the moment that attempts were made to move the eyeball to the nasal side. Careful study of the double images along the median line showed two degrees of left hyperphoria for distance, which remained the same during fixation for close work, and an exophoria of two degrees for distance, which increased to twelve degrees when the fixation object was brought to a point 35 centimetres in front of the eyes. There was considerable infiltration of the subcutaneous and orbital tissues just above the infra-orbital ridge. Decided palpation revealed the presence of a dense, unyielding mass following the orbital rim, which was limited to the inferior nasal portion of the right orbit. Both eyelids were red and œdematous. The pupil of the affected eye was larger than that of its fellow. The iris of the left eye was not so freely mobile to light stimulus as that of the right eye. The irides were quite prompt to efforts for accommodation and apparently unsuccessful attempts for

forced convergence. Vision and accommodation with the left eye were practically normal. Uncorrected vision with the right eye, which was markedly astigmatic, was reduced to one-seventh of normal, the patient being able to read test-type of one diopter size from 10 to 25 centimetres' distance without the use of a correcting lens. Corrected vision and accommodation with the right eye were normal. The fields of vision for white and red in each eye were contracted to about one-half of their usual sizes, this contraction being slightly the more pronounced with the fields of the affected eye. Slight indentations in the field borders, particularly above and below for red, and more marked in those of the left eye, were noticeable.

With the exception of a tortuous condition of the retinal arteries and veins, especially the main venous stems of the left eye, the eye-grounds were normal. A spontaneous pulsation of the retinal veins in the left eye was discernible.

The lymphatic glands at the angle of the jaw on the left side were slightly enlarged. The left nasal fossa was free along the floor. The inferior turbinal was normal, while the middle was greatly swollen and pressed against the septum. The unciform process of the ethmoid was pushed toward the median line, making a slit-like aperture between it and the middle turbinal; from this opening a copious purulent discharge was exuding and running over the inferior turbinal. There was a small and unimportant ridge on the septum. The right fossa was free, while the turbinals on this side, though somewhat swollen, did not exhibit any other abnormality. The teeth, except for the first upper molar on the left side, which was quite extensively decayed (the cavity extending for a considerable distance into the root), were in excellent condition. The palatal arch was normal. The faucial tonsils were small, and the pharyngeal tonsil, while full, did not encroach on the choanæ. The choanæ themselves were free, but a large quantity of pus escaping from the middle meatus on the left side ran down over the soft palate. The lingual tonsil was somewhat roughened. The larynx was normal.

On transillumination of the antra it was found that the light readily penetrated the facial tissues of the right side, illuminating both the cornea and infra-ocular spaces; but on the left side the corneal and infra-ocular light-reflexes were absent, the upper portion of the cheek being in shadow. This shadow, however, did not extend as far downward as is generally seen when the antrum is filled with purulent exudate. Transillumination of the frontal sinuses was not sufficiently satisfactory to afford any data.

As the result of these findings the diagnosis seemed to rest between the following possibilities: 1. Malignant growth starting in the orbit, giving rise to suppurative disease of the antrum and anterior and middle ethmoidal cells. 2. Primary antral disease induced by a carious molar, producing secondary ethmoiditis and necrosis of the lamina papyracea, with orbital abscess. 3. Primary ethmoiditis, followed by necrosis, with orbital abscess and involvement of the antrum.

Six days later, June 27, 1901, the left antrum was opened through the canine fossa while the patient was under ether. In order to ascertain whether the disease originated from the alveolus the carious molar was first extracted. The root of the tooth, however, was found to be normal, thus eliminating this source of infection. After the cheek had

been freed and the periosteum had been lifted from the surface of the maxillary bone up to the infra-orbital foramen, an opening sufficiently large to admit a finger into the antrum was made through the canine fossa. The cavity was large and did not contain much pus. In it a mass of moderately soft tissue could be felt in the region of the orbital wall. A piece of this tissue was removed for examination, and later was found to consist of a simple inflammatory hyperplasia of the mucous membrane. The antral cavity was lightly packed with iodoform gauze, though considerable pressure was employed in the wound itself in order to prevent closure of the artificial opening.

The patient did very well until June 30th (the third day after the operation), when the lower eyelid became more swollen and œdematous, and it seemed as though an orbital abscess was about to rupture through the lower lid.

On July 3 a curvilinear incision was made through the left swollen lower eyelid. The fibres of the orbicularis muscle and the ocular tendon were cut through in order to reach the ethmoidal cells. This done, there was a gush of blood-stained pus, followed by a considerable amount of pus from far back in the orbital cavity. The region of the lamina papyracea was curetted, and several pieces of necrosed bone were removed. A finger placed in the antral opening could readily feel pressure exerted by a finger passed into the depths of the orbit through the wound in the lower eyelid, proving the presence of a dehiscence in the orbital plate of the antrum. The finger in the orbit could also determine the presence of denuded bone in the region of the lower border of the os planum. No communication between the orbit and the left middle meatus could be found. The middle turbinal bone was fractured, and was displaced slightly upward and inward in order to permit better drainage from the ethmoidal cells. The packing in the antrum, which had been renewed once since the former operation, was found to be saturated with foul-smelling pus. The cavity was repacked. The external wound was practically healed within a few days' time. From this time the ocular symptoms improved, the eyelids, which were greatly swollen and œdematous for a few days after the operation, decreased in size, the proptosis lessened, and the eye continued in good condition. Upon removing the packing from the antrum on the second day after the operation a great quantity of fetid pus with a small bony sequestrum came from the opening, necessitating a repacking of the cavity every other day, until on the sixteenth day after the operation the wound through the canine fossa had sufficiently healed to permit the fitting and insertion of a hard-rubber plug. During this time several pieces of necrosed bone escaped through the opening. The discharge gradually decreased in amount and became less offensive in character.

The patient was instructed how to cleanse the antral cavity as might be required, and was permitted to return to her home.

On September 23 (two months later) Dr. Glover wrote that "The nasal opening has healed. The discharge from the antrum, though much less, continues to exude at times through the artificial opening in which the plug is still worn. There has not been any escape of bone." He also stated that soon after the patient had returned from Philadelphia she had "showed symptoms of nephritis, with considerable albumin, which has gradually grown less."

One month after this Dr. Glover wrote that some few days before he had made a careful examination of the case. Vision was the same as that at the last examination. He noted that "The infiltration of the lower lid about the cicatrix is growing more normal. The left nasal cavity shows some swelling of the middle turbinal, with discharge of pus at times. The cavity of the antrum still discharges pus, which seems to form mostly at its upper portion where the parts are congested and granular, as can be seen through the opening in the mouth." Her general health at that time was good.

On November 9 of the same year the patient again came to Philadelphia, during which time a most extended and painstaking re-examination was made, showing that all of the gross ocular symptoms for which she had first reported had practically disappeared. The left nasal fossæ were free. The turbinals were normal except that the middle one on the left side was slightly redder than is usually seen and was somewhat glazed at its anterior end. No discharge of any kind could be detected in the nasal fossæ. The pharyngeal tonsil was full, though it was not obstructing nasal respiration. The choanæ were free. The opening through the canine fossa was large and admitted a good view of the greater part of the antral cavity. A scar on the orbital plate of the antrum and several large bloodvessels running over its internal wall could be seen. The position of the osteum maxillare was easily recognized. The light from transillumination penetrated the upper portion of the face to a moderate degree, though no corneal light could be seen. On the right side of the face the normal illumination of the infra-ocular space and the corneal light were seen.

The only pathological condition that could be noted was a slight œdema along the artificial opening, which had been probably caused by irritation from the rubber plug.

The patient was, for the time being at least, considered as well.

Up to the present time, April, 1902, there has been but little if any discharge from the antrum, and this only from the edges of the artificial opening. The other local and general symptoms have disappeared.[1]

Remarks. In reviewing this case there are several points of interest which come into our minds; but the most important is that concerning the origin of the disease.

There are three possibilities: 1. Primary disease of the antrum. 2. Primary disease of the ethmoidal cells. 3. Abscess beginning in the orbit itself. The third method of origin of the disease can be excluded, as there was not any history or appearance of direct trauma nor any definite causative dyscrasia.

If it were not for the rarity of cases of antral empyema opening into the orbit this condition would seem the most likely, as the clinical history and symptoms strongly indicate such a possibility.

The points which seem to favor primary antral disease are:

1. The proof of existing disease of the antrum, as shown by the findings on opening the antral cavity. There was not much pus evacuated,

[1] Further studies of the condition will be made and continued for a future report of the case.

but the natural opening was very large. Considerable inflammatory œdema of the orbital wall was noticed, and pieces of the lining membrane of the antrum studied with the microscope showed a condition of inflammatory hyperplasia; while the packing, which was removed on the second day after operation, was saturated with pus.

2. The presence of a dehiscence in the orbital wall of the antrum, as evidenced by a finger in the antrum being able to perceive motion imparted by a finger in the orbit at the second operation; the first operative procedure did not involve the region of the orbit.

3. The cessation of discharge from the nose after free drainage from the antrum had been established.

4. The relief of all of the ophthalmic, orbital, and ethmoidal signs of the disease after the cure of the antral disturbance.

The points which seem to favor primary ethmoidal disease are:

1. The fact that disease of the ethmoid is a much more frequent causative factor in the production of orbital abscess than disease of the antrum of Highmore.

2. The presence of probable necrosis of the lamina papyracea of the ethmoid bone.

3. The relation between the small amount of pus which was found in the antrum at the time of the first operation and the profuse discharge that came from that cavity after the second operation. This increase can be most readily explained by considering that the opening between the orbit and antral cavity was either artificially created or was much enlarged at the second operation, permitting the orbital abscess to freely drain into the antrum.

4. The transillumination previous to the opening of the antrum did not give the characteristic shadow that is cast by empyema of the maxillary sinus, the shadow in this case being limited to the upper part of the face. This limitation may be accounted for either by an undeveloped condition of the antrum itself (which was not so in this case), or by an abscess of pus in the antral cavity; the shadow in the latter condition being probably caused by a thickening of the orbital wall of the sinus.

It will thus be seen that there is something to say in favor of both an ethmoidal and an antral origin of the disease, and it is at present impossible to state with any degree of positiveness from which of these two accessory sinuses the disease started. It is not improbable, however, that there was an original antral disease affecting first the ethmoidal cells and thence the orbit, or *vice versa*.

A most interesting condition, and one which was fully established by the clinical and operative findings, was that necrosis of the orbital or upper wall of the antrum had developed without any special cause in this—an acute case of simple accessory sinus inflammation.

The absence of any specific inflammation, such as tuberculosis and syphilis, is proven by the rapid recovery after proper drainage had been furnished. Another interesting fact was the development of a post-operative nephritis.

Nearly all of the text-books mention the possibility of primary empyema of the antrum terminating in abscess of the orbit. Reports of such cases, however, are excessively rare. On the contrary, numerous instances of orbital abscess originating from ethmoidal disease can be quoted, but this aspect of the question is so well known that proof of the same would be superfluous. We desire, however, to state that while admitting that ethmoidal disease is a much more frequent cause of orbital abscess, yet the fact that antral disease, leading, as it frequently does, to necrosis of the bony walls of the cavity, may produce perforation of the orbital plate, cannot be cast aside.

THE CLINICAL ASSOCIATION OF CANCER AND TUBERCULOSIS WITH REPORT OF A CASE.

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It is occasionally a useful process to remove from the shelf an old question which has apparently been settled and laid aside and examine it in the light of recent facts. The clinical association of cancer and tuberculosis appears to me to be such a question.

Considering the great frequency of each of these diseases, very nearly one-fourth of the total mortality of the civilized world being due to tuberculosis[53] and a large and apparently increasing proportion to cancer, the two diseases are not associated as frequently as they would be if there were no influences at work mutually antagonistic. My attention was especially drawn to this question recently by the study of a case in which the two diseases were associated, and which was, so far as I know, the first that I have ever met. The case presents a few other features of interest in diagnosis, and I will briefly present its main points.

Mr. H., aged forty-five years, an undertaker by occupation, was first seen August 26, 1899, at his home in Leipsic, Ohio, in consultation with Drs. W. H. Hickey and J. C. McClung. The patient was bedridden, moderately emaciated, having lost only twelve pounds within the preceding year, although this hardly expressed the degree of emaciation, inasmuch as his health had been gradually depreciating on account of digestive disturbances for a dozen years or more. With the exception of these occasional attacks of indigestion his health was fairly good

until the beginning of his present illness, which he assigned to June, 1899, less than three months prior to my visit. The cancerous processes, which will be described, must have existed a much longer time, but it was only then that inordinate gaseous distention of the abdomen called his attention to some unusual trouble in this locality. The symptoms of general abdominal distress and disturbances of the digestive functions became progressively more marked, and the debility gradually increased until he became bedridden August 2d, three weeks before my visit. Shortly after taking to his bed the extreme abdominal distention disappeared, and the principal complaint from that time on was of nausea associated with little or no spontaneous pain. The stomach became quite intolerant of food, which caused slight pain, quickly relieved by vomiting, with occasional eructations of considerable quantities of green fluid. The pulse ranged from 75 to 90, and the temperature was practically normal throughout the entire progress of the case. Once or twice a temperature of 99.5° F. to 100° F. was found, but this could easily have been due to disturbances of metabolism, and could not, or at least did not, create any suspicion of the pulmonary tuberculosis which the autopsy showed to exist. For one or two months before taking to his bed obstinate constipation had developed, and had been a constant feature in the case. The stools were not clay colored, but the urine was exceedingly dark. Physical examination revealed marked tenderness to the right of the epigastrium and extending down to the umbilicus. This tenderness, which was associated with some spontaneous pain, had been present for about a year, which probably marked the beginning of the active cancerous growth in the liver. The pain was not constant, but paroxysmal, the paroxysms occurring three or four times a week, of considerable severity, and lasting a few hours each time.

Physical examination revealed nothing wrong with the chest organs. Resonance was apparently normal, and nothing distinctly morbid could be detected by auscultation. The symptoms did not point to any pulmonary disease, and it is possible that this part of the examination was not made as critically as could have been desired in the light of the autopsy. It was made, however, with considerable care, and was absolutely negative throughout. Abdominal palpation elicited the tenderness above referred to, with more or less hypersensitiveness over the entire abdomen. The liver was found notably enlarged, especially the left lobe, which extended far into the left hypochondrium, and the portion of the liver corresponding to the left lobe was distinctly hard and nodulated. No other physical alterations could be detected by palpation or percussion. A troublesome question involved in the diagnosis was as to the presence or absence of organic stomach disease. An attempt was made to get the gastric juice for analysis, but the food was rejected too soon to furnish the desired secretion. Irrigation of the fasting stomach gave the usual evidence of chronic gastritis in the way of numerous epithelial cells and leucocytes, both of which were present in great abundance, but no pathological tissue fragments were found. All efforts to outline the stomach by inflation or filling with water were very unsatisfactory, and left me entirely in doubt in regard to its location and size. At a subsequent visit the gastrodiaphane was introduced, but gave absolutely no transillumination whatever. The record of the blood examination was unfortunately lost, but there was an extreme oligocythæmia (about 1,500,000 red cells) and leucopænia.

The urinalysis was as follows: total quantity in twenty-four hours, 630 c.c.; specific gravity, 1022; color, deep red; total solids, 32.13 grammes; urea, 3.3 per cent., or 20.79 grammes; highly acid, containing 9 per cent. by bulk of serum albumin; no sugar; 0.57 gramme of uric acid, its ratio to urea being 1 to 37; total sulphates, 1½ grammes—simple sulphates 0.9 gramme, ethereal 0.6 gramme, the ratio being 1 to 1½. The ethereal sulphates were largely represented by "indican," which was present to the extent of about 0.03 of 1 per cent.

The diagnosis of cancer of the liver was made, the question of the stomach involvement being considered impossible of solution.

The patient died about one month later, and autopsy was made twenty-four hours after death. The liver was found to be the seat of a diffused carcinomatous process, greatest in the left lobe, although involving the right lobe as well. In addition to this and what could not be determined during life, there was cancerous involvement of the pancreas and surrounding structures. The stomach, however, was free from any trace of induration or other evidence of carcinoma. It had escaped completely. An interesting point with reference to the failure of the gastrodiaphane to render any aid in diagnosis was the fact that the liver had extended forward and downward and become adherent by extension of inflammatory processes to the transverse colon, which had to be torn loose. This formed a compartment back of the liver from which the stomach could not escape, and transillumination was therefore impossible.

Upon opening the chest cavity and examining the lungs they were found to be studded from apex to base on both sides with minute deposits, microscopical study of which showed them to be typical tubercular nodules. The pulmonary lesions were at first thought to be metastatic miliary carcinosis.

The principal interest in the case centred in the coexistence of an extensive carcinomatous process coupled with wide-spread tubercular disease involving practically the entire area of both lungs. The carcinomatous process did not extend above the diaphragm nor the tubercular process below it, so far as could be determined.

The absence of fever and pulse acceleration in a case of generalized pulmonary miliary tuberculosis are points worthy of note. It naturally suggested the possibility of an antagonistic action of the toxins of cancer and tuberculosis upon the thermogenic centres. This suggestion is probably not entitled to very serious consideration in view of the fact that an occasional apyretic course of chronic miliary tuberculosis is recognized by several writers—*e. g.*, Berg[50] and Delafield.[51] It is certainly a very exceptional phenomenon. This is especially true when taken in connection with a very nearly normal pulse-rate. Berg,[50] indeed, lays stress upon the constant frequency of the pulse as an important diagnostic sign during the occasional apyretic course of miliary tuberculosis.

The controversy with reference to the frequency of the clinical association of cancer and tuberculosis began with the teachings of Rokitansky. He is commonly reputed to have taught their incompatibility.

Hamilton, for instance,[45] says explicitly that "Rokitansky taught that phthisis and cancer are incompatible diseases."

I am strongly inclined to doubt that Rokitansky ever held the extreme view above credited to him. In the only discussion of the subject by him that I have been able to find, after saying that cyst formations and tubercle do not easily occur together, he proceeds:[5] "A similar disposition—(*i. e.*, not to occur together easily in 'the same organ or organisms,' G. W. M.)—appears, though on the basis of unequally numerous observations, between tubercle and cancer. Even if they appear beside each other as of demonstrated general significance, cancer regularly follows tuberculosis; more rarely the tubercle has developed after the destroyed cancer and its crasis. Besides it is well to observe that sometimes a tubercle appears, especially in the lungs, joining with the inflamed and sanious cancer," etc. Certainly, this is very different from his reputed teaching concerning this question.

Moreover, the cases of Krauss,[1] in 1832, and Carswell,[2] in 1834, being the first recorded cases of the clinical association of these two diseases, were both published in Germany, four and six years respectively after Rokitansky's graduation, and ten and twelve years before he reached the rank of Professor, when, and probably not much before which time, his opinions may have attracted attention. He was scarcely ignorant of these observations.

But be this as it may, the question continued to receive intermittent discussion for about forty years, and resulted, as will be seen by the appended bibliography, in a considerable literature.

Some of the earlier observations, reporting the association of the two diseases, appear to be open to suspicion. For instance, in 1840, Annan[3] reports a case of pulmonary tuberculosis with six carcinomatous ulcers of the ileum. It would probably require more accurate methods than were available at that time to convince us that multiple ulceration of the intestines occurring in a case of pulmonary tuberculosis was not itself tubercular.

It was during the two decades, 1860 and 1880, however, that most of the reports were made, and the question apparently settled and dismissed. In 1863 A. B. Clarke[18] reported a case and expressed surprise that anyone should maintain that the diseases were antagonistic.

The elaborate brochure of Croizet,[24] in 1875, reporting twenty-two cases, and quoting fourteen more from Weissberger, followed by that of Gouin,[42] in 1878, reporting thirty-four cases, practically closes the history of the discussion, and it only finds brief reference, if mentioned at all, in subsequent literature.

It appears to me to be a remarkable fact that it took the accumulated observations of several decades to dispose of the question of the mutual absolute exclusion of cancer and tuberculosis, each by the

other; for this was the form the question really assumed. One-fourth of the human race in civilized countries are afflicted with tuberculosis, with an approximate mortality of 50 per cent. In 1896 very nearly 5 per cent. of the total mortality of England and Wales was due to cancer. Either the clinical picture or the findings at the autopsy are fairly distinctive in the average cases of both cancer and tuberculosis. Here, then, are two characteristic and totally distinct diseases, both very chronic, as a rule, implicating very nearly 30 per cent. of the population of the civilized world, and associated so rarely that their very co-existence was a matter of dispute over several decades, and by the ordinary laws of coincidence the association of two such diseases should easily come within the frequent observation of every clinician of large experience. Yet such is certainly not the fact. The case above recorded, for instance, being the only one that I have ever seen, was reported to a pretty full meeting of the local medical society in this city, and not one of the members had ever met with such a case. I have recently talked with four surgeons of national reputation, and not one of them was able to recall having seen a single case of combined cancer and tuberculosis.

One of the most recent utterances on the question of the association of cancer and tuberculosis is that of Williams,[48] in the *Twentieth Century Practice of Medicine.* He says: "Although cancer and tuberculosis are thus intimately connected (*i. e.*, in family history), it is very rare to find both diseases in active progress in the same individual. I have met with this conjunction only twice in 136 cancer necropsies. Kelynack, at the Manchester Infirmary, found it only twice in 145 similar necropsies.

From what has been stated, it is obvious that there is a certain antagonism between *active* tuberculous disease and cancer. The outbreak of cancer often follows or coincides with the healing of pulmonary tubercle, although in most cases the intervening period is fairly protracted. It is also evident that active tuberculous disease is of much less frequent occurrence in the cancerous than in the non-cancerous. There is, however, no absolute incompatibility between these morbid manifestations, but the comparative rarity of their co-existence is noteworthy. I even know of a few instances in which tuberculous disease and cancer of the same part have co-existed: thus Crawford has met with this conjunction in the mamma; Franque, in the uterus; Frerichs, in the liver; Crone, in the larynx; Dalton, in the large intestine; Naegli, in the rectum, ileum, and cæcum; and Friedlander reports the development of cancer in the wall of a tuberculous cavity in the lung. Instances of 'lupus cancer' have also been described."

It will thus be seen that while about 25 per cent. of the total population are afflicted with tuberculosis, it was only found four times in

281 autopsies of cancer patients, or in about 1.4 per cent. In other words, if we can judge from these data, it is nearly twenty times as frequent in the non-cancerous as in the cancerous. Coupled with the acknowledged rarity of the association of the two diseases from the stand-point of clinical observations, it presents a question of great scientific interest.

Boas[52] has recently reported 141 cases of gastric cancer, with pulmonary tuberculosis, in five cases, or about 3.5 per cent. In one series of autopsies of cancer patients about 12 per cent. of the cases showed *obsolete* tubercles. This, of course, has no bearing on the real question of antagonism between the two morbid processes, as this can only be supposed to exist when the diseases are in an active state, especially if the "antagonism" is in the nature of a chemical poison. The fact that a patient has had an active tuberculous lesion indicates a lowered resistive power of the organism, which might even be favorable to the genesis of cancer whatever its pathology may be. The contrary could only be assumed on the basis of a special diathesis of each disease, for which the evidence is lacking. Indeed, so far as family diathesis or "tendencies" are to be considered the two diseases are apparently closely related instead of being in any degree opposed to each other.

The exceptional occurrence of cancer and tuberculosis in the same patient, or even in the same organ, cannot be considered as completely invalidating a general law of antagonism of the two diseases. This would not be in keeping with the logical principles which have heretofore governed us in deciding questions of this sort. Take, for instance, the general law of immunity to the acute infectious diseases produced by a single attack. No one questions the adequate basis of such a law. It is commonly enunciated without qualifications. The exceptions are so rare that they are practically ignored; and yet Mycelius[49] has collected from the literature 514 cases of smallpox, 33 of scarlet fever, 37 of measles, 208 of typhoid fever, and 34 of cholera, which had from two to four attacks.

The fact that carcinoma has been known to develop in the wall of a tubercular cavity is an interesting observation, but is not entitled to as much weight in the question under discussion as might at first sight appear to be the case. It is, of course, rare enough to rank as a pathological curiosity, and proves no more than exceptions to other pathological laws of a general character. But, in order to have any weight at all, it is necessary to know that the tuberculous process is active at the time. It is well known that there are inactive periods in the history of many if not most cases of tuberculosis; and in the "quiescent state" the tubercle bacilli may fairly be assumed to be less virulent. They would produce less toxins, or none, and it is to these that the "antagonism" to cancer, if such exists, is probably to be imputed.

It should be borne in mind in this connection that the formation of a tubercular cavity is preceded by a very active tissue proliferation, which ends in a coagulation necrosis, and that these irritative phenomena are really very favorable to the genesis of cancer.

This is a fact well recognized in pathology and especially well attested in the special fields of gynecology and gastrology. It is, I think, generally held by gynecologists at the present time that lacerations and other irritative lesions of the endometrium are favorable starting points for the development of cancer. In the stomach it is a well-recognized fact that carcinoma is engrafted on a benign ulcer with considerable frequency. Whatever may be the etiology of cancer, these irritative processes, with surface erosions and more or less unprotected stomata and tissue interspaces, favor the inception of cancer either by local infection or nutritional tendencies. With the well-recognized incidence of cancer upon the basis of non-specific ulceration it ought to be frequently found in tubercular ulcerations if there were no deterrent influences. Such is certainly not the case. This finds a partial explanation, it should be observed, in what might be termed the anatomical predilection of the two processes. In this connection, the observations of Rokitansky are worth producing, as he gives them in the tabular form :

Frequent:	Pulmonary tuberculosis.	Rare:	Pulmonary cancer.
"	Ovarian cancer.	"	Ovarian tubercle.
"	Salivary gland cancer.	"	Tuberculosis of the salivary glands.
"	Cancer of the stomach.	"	Tuberculosis of the stomach.
"	Cancer of the œsophagus.	"	Tuberculosis of the œsophagus.
"	Cancer of the rectum.	"	Tuberculosis of the rectum.
"	Tuberculosis of the small intestine (ileum).	"	Cancer of the small intestine (ileum).

Still, there are locations, such for instance as the upper end of the respiratory and digestive tracts, where both processes are sufficiently common to furnish an adequate basis of observation, and the frequency of both diseases in this and other locations, coupled with the extreme rarity of their association, is certainly a notable circumstance.

SUMMARY. 1. Cancer and tuberculosis are so rarely associated in the same individual as to indicate a mutual antagonism between the two diseases. Autopsies on 281 cancer patients revealed only 1¼ per cent. of cases of tuberculosis. In the non-cancerous its frequency is nearly twenty times as great.

2. The antagonism is not " diathetic," but is probably due to the chemical products of the two morbid processes, that of each being inimical to the other.

3. There is a rather intimate relationship existing between the two diseases in certain families. The existence of either appears to favor the occurrence of the other, probably by a lowering of " resistive power " in the individuals of such families.

4. The two diseases are not absolutely incompatible. They may very exceptionally exist in different parts of the same individual. Still, more rarely, they may exist in the same organ, and even in identically the same tissue. In the latter case it is probable that the primary disease was quiescent when the secondary one developed.

5. In view of these apparent antagonisms, and the occasional retrocession of cancer after the use of tuberculin (though very doubtfully attributable to the latter), it would seem worth while in properly selected inoperable cases of cancer to try the systematic local injection of tuberculin in the cancerous tissue.

Bibliography.

1. Krauss. Markschwann, Tuberkeln und Skirrhus in einem Individuum. Med. Convers. Bl., Hildburgh., 1832, vol. iii. pp. 193–198.

2. Carswell. Ueber den Tuberkel und das Carcinom. Eingetheilt und eingeleitet von J. F. H. Albers. Journ. d. Chir. u. Augenh., Berl., 1834, vol. xxi. pp. 124–163.

3. Annan. Phthisis Pulmonalis; Chronic Gastritis; Carcinoma of Intestines. Maryland Med. and Surg. Journ., Baltimore, 1840, vol. i. pp. 329–331.

4. Heim. Krebs und Tuberkelprocess schliessen sich nicht gegenseitig aus. Ibid., 1840, vol. x. pp. 193–196.

5. C. Rokitansky. Handbuch der pathologischen Anatomie, 1842, vol. i. p. 423.

6. Engel. Krebs und Tuberkel. Oesterr. med. Wochenschr., Wien, 1842, pp. 265–270.

7. Brieger. De scirrho ac tuberculo sese invicem excludentious. 8° Berolini, 1843.

8. Jackson. Apparent Conjunction of Cancer and Tubercle in the same Organ—the Testicle, Ibid., 1848, vol. xvi. p. 301.

9. Gorup-Besanez. Gestielte Geschwulst an der rechten Ferse; Extirpation; Tod dorch Consumption; Carcinoma medullare cum reticulo. Arch. f. physiol. Heilk., Stuttg., 1849, vol. viii. p. 740.

10. Broca. Cancers multiples de la peau, des ganglions et des ovaires. Bull. Soc. Anat. de Paris, 1850, vol. xxv. pp. 131–137.

11. Legrand. Memoire sur la coincidence des diatheses tuberculeuse et cancereuse avec manifestations scrofuleuses. Rev. med. Franc. et etrang., Paris, 1850, i. vol. pp. 459–481.

12. Bristowe. Coexistence in the Lungs of Cancer and Miliary Tubercle (?). Trans. Path. Soc. London, 1852–53, vol. iv. pp. 35–39.

13. Martius. Die Combinationsverhaltnisse des Krebses und der tuberculose. 8° Erlangen, 1853.

14. Packard. The Pathological Relations of Cancer and Tubercle. The American Journal of the Medical Sciences, Philadelphia, 1859, n. s. vol. xxxviii. pp. 84–101.

15. Majer. Combination von Tuberkeln des Gehirns und der Lungen mit carcinom der linken Mamma nebst Fettleber. Med. Cor.-Bl. d. Wurt. temb. arztl. Ver. Stuttg., 1861, vol. xxxi. p. 318.

16. Clans. De carcinomate et tuberculosi in eodem homine, adjectis quatuor exemplis. 8°. Gryphiswaldae, 1862.

17. Haldane. On the Coexistence of Cancer and Tubercle. Edinburgh Med. Journ., 1862, vol. viii. pp. 343–349

18. Clarke. Case of Coexistence of Cancer and Tubercle. Boston Med. and Surg. Journ. 1863, vol. lxvii. p. 474.

19. Oppolzer. Lungen und Darmtuberkulose mit uterus-krebs. Spitals-Ztg., Wien, 1863, pp. 257, 273, 281.

20. Gordon. Scrofulous Tubercle in Cerebellum; Scrofulous Tubercles in Lungs, with Cancerous Degeneration of the Pleura. Dublin Med. Press, 1863, vol. xlix. p. 214.

21. Stein. Tuberkulose in der Jugend, Krebs in den vorgeruckteren Jahren. Memorabilien, Heilbr., 1864, vol. ix. pp. 198–203.

22. Concato. Delle affinita fra tuberculo e cancro e della sostituzione loro ereditaria. Ebd. clin. di Bologna, 1864, p. 809; 1866, vol v. p. 329.

23. Friedreich. Krebsmetastase auf den Fotus; Combination von Krebs und Tuberculose. Arch. f. path. Anat., etc., Berl., 1866, xxxvi. pp. 465–482.

24. von Heider. Tuberculose, Krebs, combinirt mit meningitis und Geistesstorung. Med. Cor.-Bl. d. Wurttemb. arztl. Ver., Stuttg., 1866, vol. xxxvi. p. 167.

25. Andrews. The Relations of Cancer and Consumption to Climate in the United States. Chicago Medical Examiner, 1866, vol. vii. pp. 737–740.
26. de Giovanni. Contribuzione alla dottrina della affinita fra tuberculosi e cancro, etc. Riv. clin. di Bologna, 1867, vol. vi. pp. 76–78.
27. Pelaggi. Sostituzione di tuberculo e cancro. Riv. clin. di Bologna, 1867, vol. vi. p. 73.
28. Holden. Relation of Cancer and Tubercle. THE AMERICAN JUORNAL OF THE MEDICAL SCIENCES, 1868, n. s., vol. lvi. pp. 352–356.
29. Pierazzini. Contemporanea evolutione di tuberculosi polmonare e di carcinoma dello stomaco e del fegato. Riv. clin. di Bologna, 1869, vol. viii. pp. 171–173.
30. Piattelli. Comunicazione di un caso di contemporanea evoluzione acutissima del cancro e del tuberculo. Ibid., pp. 105–108.
31. Burdel. Le tubercule issu du cancer (Rapp. de Vigla). Bull. Acad. de Méd., Paris, 1870, vol. xxxv. pp. 463–467.
32. Lepine. De la propagation du cancer et du tuberculea la surface de la sereuse pleurale et particulierement a la plevre diaphragmatique. Gaz. Méd. de Paris, 1870, vol. xxv. p. 184.
33. Peter. Tuberculisation pulmonaire consecutive aux cancers de l'œsophage et de l'estomac; coincidence des deux diatheses. Journ. de Méd. et chir. prat., Paris, 1875, vol. xlvi. p. 395.
34. Croizet. Coincidence et rapport du tubercule avec le cancer. 4°. Paris, 1875.
35. Behier. Observation, etc., tuberculeuses et carcinomateuses. Moniteur Journ. de Méd., etc., Paris, 1876, vol. i. pp. 346, 359.
36. Leube. Ziemssen's Cyc. of Pract. Med., 1876, vol. vii. pp. 236–247.
37. Josso. Coexistence du cancer et du tubercle. Bull. Soc. Anat. de Nantes, 1876–78, Paris, 1879, vol. i. p. 94.
38. Moutard-Martin. Coexistence du cancer du tubercle et de l'emphyseme. Bull. Soc. Anat. de Paris, 1877, vol. lii. p. 471.
39. Miller. Cancer and Phthisis. Amer. Practitioner, Louisville, 1877, vol. xvi. pp. 20–24.
40. Potain. Elements de diagnostic des cancereux et des tuberculeux. Mouvement Méd., Paris, 1877, vol. xv. p. 49.
41. Mora. A propos du cancer et de la tuberculose, de l'influence de l'alcool et du tabac dans la production de ces maladies. Courier Med., Paris, 1878, vol. xxviii. pp. 281–289.
42. Gouin. Coincidence et rapport de la tuberculose pulmonaire et du cancer. 4°. Paris, 1878, p. 38.
43. Burdel. Cancer et tubercule developpes chez le meme sujet. Ibid., 1879, 2 s., vol. viii. pp. 407–412.
44. Picot. Gaz. hebd. de Méd., Paris, 1879, 2 s., vol. xvi. pp. 406–410.
45. D. J. Hamilton. Pathology, 1894, vol. ii. p. 154.
46. W. Roger Williams. Twentieth Century Practice, 1898, vol. xvii. pp. 270–271.
47. W. M. L. Coplin. Manual of Pathology, 1900, p. 321.
48. W. Roger Williams. Twentieth Century Practice of Medicine, 1898, vol. xvii.
49. Frederick Forchheimer. Ibid., vol. xiv.
50. Berg. Tuberculosis. Ibid., vol. xx. p. 51.
51. Francis Delafield. Tuberculosis. American Text-book of Theory and Practice of Medicine, vol. ii.
52. Boas. Observations on Carcinoma of Stomach. THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, February, 1902, p. 341. (Abstract.)
53. Lartigau. Tuberculosis. Twentieth Century Practice of Medicine, vol. xx. p. 95.

PRIMARY CARCINOMA OF THE URETHRA IN WOMEN.

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PRIMARY carcinoma of the urethra in woman is a very rare affection. In cases of primary carcinoma of the vagina and vulva, which also is an infrequent disease, secondary involvement of the urethra by extension is not uncommon. Excluding these cases as not belonging to the

class under consideration, E. Ehrendorfer[1] (to whose exhaustive article I am indebted for many of the data contained in this paper), in 1899, was able to collect only twenty-seven cases, including his own case, in which the urethra was primarily affected with carcinoma. Since then I have been able to collect from the literature and personal communication eight more cases (McGill, C. Kynoch, Sanderlin, Orthmann, C. Jeff. Miller, Goffe, Brothers), including my own. It is interesting to note that three of these cases should have occurred in this city within a year.

Mrs. L. W., was referred to me August 10, 1900, by her physician, Dr. E. Hochheimer, for some affection of the urethra. She was aged thirty-six years, had been married fourteen years, and was the mother of three children, the youngest being nine years of age. In October, 1899, she had had a severe attack of dysentery, and ever since then there has been moderate enlargement of the liver. For years she has suffered from frequent micturition, but the act was never attended with any pain, and she never consulted a physician for it. For the past six months, however, she has suffered with a burning sensation in the region of the urethra, and for about the same period the act of micturition has been attended by a smarting pain. She has never passed any blood per urethram, nor has she ever had any urethral discharge.

Her menses were regular and profuse, as they always had been. Her family history was negative.

Present Condition. She is a well-built woman, well-nourished, and moderately anæmic.

The urethral meatus looks normal, though moderately dilated, but just within its margin appears a firm growth which seems to involve the outer two-thirds of the urethra. The growth completely surrounds the urethral canal, but is much thicker posteriorly and laterally. The visible portion of the growth just within the meatus presents a somewhat granular appearance, the free surface of which bleeds readily to the touch. The affected two-thirds of the urethra is very hard and firm and corresponds in size to a small-sized thumb. The vaginal mucous wall overlying it is perfectly normal and is freely movable. There is no enlargement of the inguinal glands. I could readily introduce a No. 9 Kelly's cystoscope into the urethra and could see that the vesical sphincter, as also the urethral mucosa immediately adjacent to it, was normal. The bladder mucosa presented nothing abnormal. The uterus was found in retroversion and rather firmly fixed; the adnexa apparently normal. The liver border extended down to a level on a line with the umbilicus, but was perfectly smooth and had been of this size since the attack of dysentery, as previously stated. The diagnosis of primary carcinoma of the urethra was made and immediate extirpation of the growth was urged.

The patient was operated upon three days later (August 13th) at St. Mark's Hospital. In order to go wide of the disease the whole urethra, including a fairly wide strip of the overlying vaginal mucosa, was extirpated. It was my intention, however, to leave the vesical sphincter intact. But after dissecting the urethra beyond what I took to be a safe distance from the inner margin of the growth, and on dividing it from above downward, I found that the urine was not entirely retained

FIG. 1.

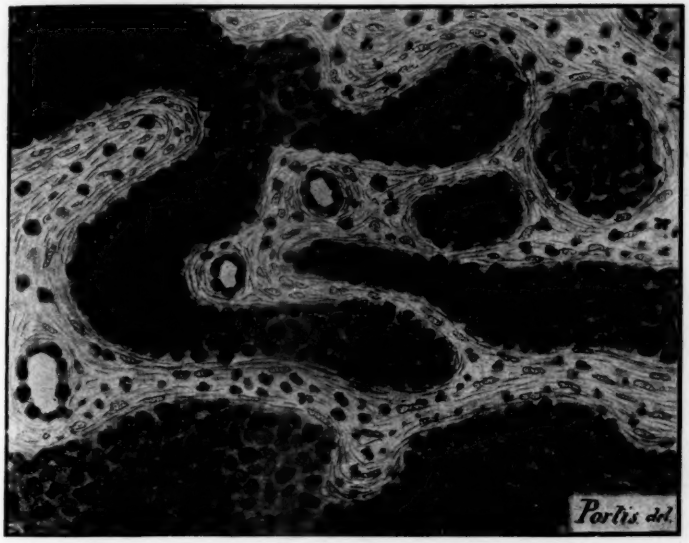
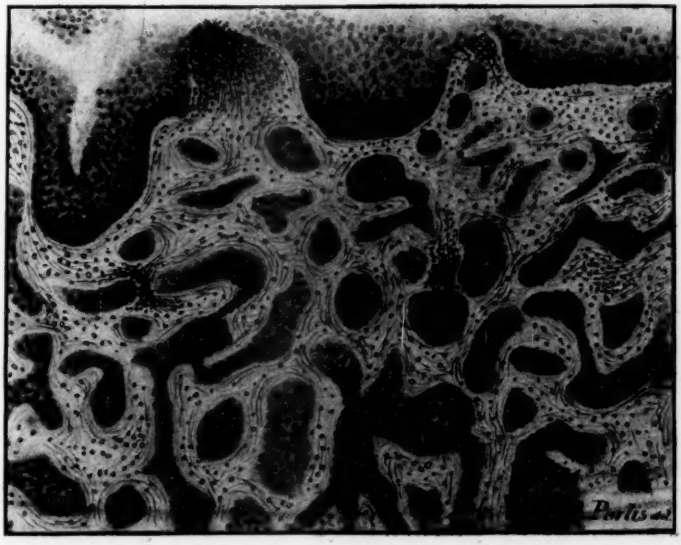


FIG. 2.



within the bladder, and began flowing out through what seemed to me a vesical sphincter that had lost its function. As far as I could tell the incision had stopped short of the sphincter, but evidently not enough of the urethra had been left to permit the sphincter to exercise its customary function. After the numerous vessels that had been clamped during the operation had been ligated, I passed a catheter into the bladder and narrowed the sphincteral opening by a couple of sutures, as one would a torn rectal sphincter. The deep and large raw surface created by the excised urethra was diminished in size by several catgut sutures, and then it was easy to bring into coaptation the cut edges of the vaginal mucosa by several interrupted silkworm-gut sutures.

Two days later the catheter was removed and the bladder was irrigated. There seemed to be good control. On August 20th (the seventh day after the operation) the sutures were removed, and now for the first time the urine came away involuntarily. For the following month the patient would at times have fairly good retentive power, and at times she had scarcely any. Later on, however, she had no retentive power whatever, and the urine kept constantly dribbling away from her. The loss of function on the part of the sphincter seemed to be due in part to the traction of the vaginal wall backward by the displaced cervix (the uterus being in fixed retroversion), and in part to the absence of any urethral canal. I proposed an attempt to remedy the defect by an operative procedure to bring the uterus in antroversion, and to build up an artificial urethra. The patient would not consent to any extensive operation, but was willing to submit to the lesser procedure at her own home (a small apartment) of building up an artificial urethra. This attempt was accordingly made on November 23, 1900. A strip of about an inch wide of vaginal wall just beyond the bladder opening was dissected out, and this was made to glide forward in the direction of the pubis, and was sutured by interrupted silkworm-gut sutures to a denuded line on either side of the proposed new urethra. The meatus of the new urethra was carried pretty high up on the vestibule. A catheter was left *in situ*. This had to be removed after the lapse of twenty-four hours on account of the irritation it caused. The patient was allowed to void urine herself, and she could easily retain her urine for four hours at a time. On the night of November 27th (four days after the operation) the patient retained her urine from 11.30 P.M. until 7 A.M (7½ hours).

November 30, 1900. Removed most of the sutures. Some of them have suppurated through the tissues. The new meatus has dropped back quite a distance.

December 2. Removed the remaining sutures. Patient has fairly good retentive power.

February 1, 1901. The new urethra has given way for the greater part. Still the patient has much better retentive power than before the operation; with care she can hold her urine for two hours at a time.

January 2, 1902. She has little or no retentive power; the urine dribbles away constantly. In the supine position at night she can retain her urine for an hour or longer. The parts look perfectly healthy. The opening in the bladder is fairly constricted, and one wonders why she has no retentive power. The retroflexion of the uterus and the consequent traction upon the anterior vaginal wall, draw-

ing the vesical opening backward, may be the chief factor in the loss of vesical control. I feel rather confident that a vaginal fixation and another attempt at building up a urethral canal would give fair retentive power. The most careful examination fails to detect any evidence of a recurrence. The general health of the patient is excellent.

Dr. F. S. Mandlebaum, pathologist to Mt. Sinai Hospital, kindly made a microscopical examination of the extirpated growth. He found it to be a flattened cell carcinoma, a diagnosis with which several prominent pathologists who had seen the slides concurred. The vaginal wall which was removed with the growth was found to be normal.

The excellent drawings of the microscopical findings were made by my friend, Dr. M. M. Portis, of Chicago, to whom I take this opportunity of expressing my indebtedness.

Considerable confusion exists in the classification of cancerous growths in the region of the vestibule and urethra. This confusion has arisen in part from the circumstance that in advanced cases it is difficult to determine whether the growth originated first in the vulvar tissues and later extended to the urethra. The classification by Ehrendorfer into "urethral carcinoma," that originating in the urethral mucosa, and "vulvo-urethral carcinoma," that developing in the tissues immediately surrounding the urethral mucosa, seems the most practical and most in accord with the pathological findings. In the latter variety the mucosa may become involved, but it does so by a process of extension from the peri-urethral tissue.

Vulvo-urethral carcinoma, by far the most common variety, is rather a superficial process, and is a squamous-cell carcinoma. It begins either in the form of a papule or as a hard nodule lying apparently underneath the mucosa, or as a deep-seated infiltration which only after the lapse of some time shows superficial ulceration. It may also develop as a corroding cancerous ulcer lying in contiguity to the urethral meatus and extending gradually inward and outward. It has a predilection for the peri-urethral tissues, so rich in blood and lymph vessels, thus constituting what is commonly known as peri-urethral carcinoma.

Primary urethral carcinoma is that form which develops from the epithelia in the urethral mucosa, or more especially in the glandular structures. It extends in both directions, and finally involves the vesical sphincter and the bladder in the form of papillomatous carcinoma. Even in advanced cases the vestibule and vaginal introitus may remain free from the cancerous process. When the distal part of the urethral mucosa is affected after the growth has undergone ulcerative degeneration a crater-like dilatation of the meatus occurs, with marked infiltration of the borders. In some very advanced cases the ulcerative process breaks through the urethro-vaginal septum, forming a urethro-vaginal fistula.

In those cases in which a polypoid growth of the urethral mucosa, or a partial prolapse of it, undergoes malignant degeneration, the cancerous mass takes the form of an intensely red, cauliflower-like growth, bleeding readily to the touch, which may be as large as a walnut protruding from the meatus, and apparently being attached by a pedicle.

The distinction between *vulvo-urethral* and *urethral* carcinoma is easy in the early stages, but when the disease is more advanced it is attended with great difficulty and can only be made after a thorough anatomical and histological examination.

Urethral carcinoma (epithélome primitif de l'urethre) is by far the rarer of the two affections. In Ehrendorfer's collection of twenty-seven cases only seven belonged to this variety. They were the cases of Bardenheuer, Thomas, Winckel (two cases), Soullier-Picqué, Swan, and Ehrendorfer's own case.

In my collection of eight cases, three (Goffe's, Miller's, and my own) may probably come under this heading.

CASE XXVIII.—A. F. McGill (*London Lancet*, 1890, p. 966. Overlooked by Ehrendorfer). The patient, aged fifty years, had painful and difficult micturition for five months. A hard nodular mass extending from the urinary meatus to the base of the bladder. Operation, suprapubic incision, through which the growth was pushed with the fingers down into the vagina and removed through that canal. The vesico-vaginal fistula was closed and a tube inserted in the suprapubic opening. Ultimate result not stated.

CASE XXIX.—C. Kynoch (*British Medical Journal*, vol. i., 1901). The disease affected the outer two-thirds of the urethra. Full data of case not given. Disease recurred in three months, and patient died ten months after the operation.

CASE XXX.—Sandelin (*Centb. für die Krankheiten der Harn und Sexual Organe*, 1900). Notes meagre. A woman, aged sixty-five years. Urethra and growth extirpated. Result not stated.

CASE XXXI.—Orthmann (*Zeitschrift für Geb. und Gyn.*, 1901, Band xlv.). Patient, aged seventy-five years. For two years suffered with irregular hemorrhages, which have increased in quantity lately. On examination noticed a cauliflower growth projecting between the labia, which resembled a prolapsed cervix, but on close inspection it was seen that the tumor involved the urethra. Growth was extirpated together with 3 cm. of the urethra. The patient had incontinence at first. Later on had full retentive power. No mention of condition of inguinal glands.

CASE XXXII.—J. Riddle Goffe (*New York Medical Record*, July 6, 1901). The patient, an unmarried woman, aged twenty-eight years, suffered with frequent and painful micturition for the past six years. The symptoms were growing steadily worse. She had been treated by various gynecologists for supposed anteversion of the uterus. A small growth was detected by palpation in the region of the vesical sphincter. Cystoscopic examination of the bladder showed its mucosa to be normal. The small growth was found to be attached to the vesical sphincter, which it had infiltrated. It was generously dissected. The patient

made a good recovery, and was free from symptoms two months after the operation. Microscopical examination showed the growth to be an epithelioma. Condition of inguinal glands not stated.

CASE XXXIII.—C. Jeff. Miller (*American Gynecological and Obstetrical Journal*, November, 1901). A widow, aged fifty-two years, had difficult urination for two months; a sessile growth upon the floor of the urethra. The patient declined operation for a month, when the disease had evidently extended to the bladder. The urethra was removed flush with the sphincter. Recurrence in two and one-half months. The patient died eight months later.

CASE XXXIV.—A. Brothers (*American Journal of Obstetrics*, January, 1902). The patient, aged fifty-nine years. Multipara. Frequent and painful micturition for ten months. Latterly inability to void urine. The entire length of the urethral canal was embedded in a hard sausage-shaped mass, which encroached upon the vaginal lumen below and to a lesser extent involved the sides and upper portion of the vestibule. The whole urethra and adjacent portion of the vaginal wall was extirpated. Incontinence at first. Four months later the patient is in good health, and "has practically regained perfect control over her bladder." Pathological report, "pure epithelioma."

It is doubtful if this case belongs to either of the varieties classified by Ehrendorfer. It presents rather the features of carcinoma of the anterior vaginal wall involving the urethra secondarily.

Dr. Brothers kindly permitted me to examine the specimen, and from its appearance it is impossible to tell whether it originated in the vaginal wall and extended secondarily to the urethra, or *vice versa*.

ETIOLOGY. The age of the patients affected with carcinoma of the urethra varied from twenty-eight to seventy-five years. Under forty years of age there were seven cases (cases of Bardenheuer, Thomas, von Winckel, Zweifel, Goffe, Vineberg); two cases were over seventy years; three cases occurred between the fortieth and fiftieth year; thirteen cases between the fiftieth and sixtieth year, and ten cases between the sixtieth and seventieth year. With the exception of seven cases, including the writer's, all the patients had reached the menopause.

It would, therefore, appear pre-eminently to be a disease of middle and advanced life. Ehrendorfer ascribes as a predisposing factor local chronic inflammatory processes. He says, inasmuch as carcinoma of the male urethra is known to develop in cases of stricture, the same probably holds good for the urethra in women, in whom stricture may exist without any symptoms. Knowing with what frequency stricture of the male urethra occurs and how rare the occurrence of carcinoma is (scarcely a dozen cases in the literature), such an assumption does not seem warranted. Still, it seems plausible that long-continued traumatism may play some rôle in the causation. Most of the women in whom the disease developed were multipara, in whom a gaping of the meatus and some prolapsus of the urethral mucosa is not uncommon.

Ehrendorfer is also of the opinion that urethral caruncles (polypoid angioma, glandular polypi, and cystic adenomas) under continued irritation may develop into carcinoma. Of course this cannot be denied. Still, the writer has seen a fairly large number of so-called urethral caruncles which had existed for a long time without showing any malignant tendencies.

Symptoms. Owing to the comparative shortness of the urethra in women and its comparative width, the disease may exist for some time without giving rise to any symptoms. Considerable length of time may elapse before the disease interferes with the act of micturition. The first symptom may be a burning sensation attending the act of voiding urine. My patient complained of a smarting sensation in the urethral region. Other patients have complained of a pruritus in the vicinity of the urethra and vestibule. Hemorrhage and discharge are very late symptoms.

On inspection there may be seen a small cauliflower growth projecting from the meatus, which, on careful searching, may show the fine finger-like processes so fully described by Cullen as occurring in squamous-cell carcinoma of the cervix. Such a growth will bleed readily on the slightest touch. The affected part of the urethra will have the characteristic hard, infiltrated feel common to malignant growths.

In other cases (as in the writer's case) the growth does not project beyond the meatus, and in some an endoscopic examination may be necessary to detect its presence (Goffe's case). When the affection is more advanced, crater-like ulcerations, with hard, infiltrated edges, and covered with a dirty, grayish, foul discharge, will be observed. Fortunately in the majority of cases the disease does not extend rapidly, and may exist for a long time before involving the bladder.

Diagnosis. The conditions most frequently met with in the urethra in women and which must be differentiated from carcinoma are: (1) Urethral caruncle (papillary polypoid angioma of Winckel); (2) prolapsus of a portion of the urethral mucosa; (3) fibroid mucous polypi.

Urethral Caruncle. These tumors vary in size from a pin-head to a cherry, are usually of a bright red color, smooth in appearance, and do not readily bleed. They are usually multiple, but may be single, and are situated near the meatus, generally on the posterior lip. They show no great tendency to increase in size, and generally are extremely tender.

Prolapse of the Urethral Mucous Membrane. In multiparæ it is not uncommon to see a condition which is often mistaken for urethral caruncle. On close observation it will be seen that the meatus is irregularly torn and that a portion of the mucous membrane has prolapsed. The apparent growth has not the bright red color nor the sensitiveness of a urethral caruncle. It is found to be continuous with

the remainder of the mucous lining and does not possess the hardness nor the tendency to bleed of a malignant growth. It seldom gives rise to any marked disturbance.

Fibroid or Mucous Polypi. These are comparatively rare. They are usually situated within the urethral canal, and can then only be detected with the aid of the endoscope. They are pale in color and do not show any tendency to bleed. They are usually pedunculated. The writer operated upon a case during the past summer in which a fibroid the size of a kidney bean was situated in the posterior wall near the meatus.

PROGNOSIS. This will depend, as in carcinoma of other parts, upon the extent of the disease.

Melchiorj's[2] division into three stages is of practical prognostic value. In the first stage, where the disease does not extend to over half of the urethra and metastases are absent, a radical extirpation of the diseased parts may be followed by a freedom from recurrence for many years. In the second stage, where the disease has affected the whole urethra and has extended to the periosteum of the pubic bones, the outlook for a permanent cure is not very promising. In the third stage, where the disease has extended to the neck of the bladder and the adjacent soft parts, a radical operation is scarcely feasible. Latterly cases even in this stage have been subjected to extensive operations, but sufficient time has not yet elapsed to determine the efficacy of such procedures.

TREATMENT. Of course, so far as the disease itself is concerned, only one course deserves any consideration, and that is total extirpation when this is feasible. As already stated, when the disease has extended to the periosteum of the bones and to the neck of the bladder, the propriety of subjecting the patient to an operation is very questionable. In operable cases the growth is usually so situated as to be accessible through the vagina. McGill, however, found it necessary in his case to make a suprapubic incision into the bladder, so as to enable the fingers to depress the growth into the vagina. When, as in McGill's case, the disease involves the neck of the bladder, it is better to close the bladder below and create a suprapubic fistula, after the method of Witzel. In this way the patient may have a certain degree of control. In other cases, when the urethra is excised quite close to the vesical sphincter, there may be loss of control at first, but as the parts cicatrize the patient regains a fair degree of retentive power. In some of these cases the degree of control may be increased by a plastic operation, having for its object the creation of a new urethra. The attempt in my case was not very successful, but as I have already stated, the failure was, in part, due to the backward position of the uterus. For this class of cases when the lack of control is in a measure due to an absence of any urethral canal, Gersuny[4] has resorted to an ingenious device which has been attended with wonderful success in

his hands. He injects liquefied paraffin ointment (which has a melting point of 40° C.) into the submucous connective tissue about the opening into the bladder, thus forming an elevated ring resembling the projection of the prostate gland in the male urethra. This ring offers a resistance to the flow of urine, requiring a certain degree of voluntary force to overcome, thus enabling the patient to void her urine at will.

The ring thus formed remains for an indefinite time. In one of Gersuny's cases it had existed in *statu quo* for over a year.

I was very much tempted to resort to this procedure in my case, which seemed to be especially suitable for it. But shortly after the publication of Gersuny's article Pfannensteil[5] reported a case in which the procedure was followed by alarming symptoms, evidently due to a paraffin embolism in the lung. I did not care to run the risk of a similar experience, and consequently refrained from carrying out the method in my patient.

In cases when the incontinence causes great annoyance to the patient and is productive of extensive excoriations, and when a suprapubic fistula is not feasible, as in a very fat patient, Fritsch has proposed and carried out the complete closure of the vagina and the creation of a rectovaginal fistula. The urine thus collects in the ampulla of the rectum and is discharged with the stool. This procedure is not free from danger from subsequent bladder infection, although Fritsch claims there is very little danger of this, providing the bladder is healthy at the time of the operation. The procedure, from its nature, would necessarily be very much limited in its application. Both husband and wife would have to give their consent after receiving a full explanation of what the operator proposes doing.

References.

1. Ehrendorfer. Archiv für Gyn., Band lviii. Heft 3, p. 463.
2. Giov. Melchiorj. Annali universale di medicina. Milano, 1869, vol. ccx.
3. F. v. Winckel. Pathologie der weiblichen Sexual Organe. Leipzig, 1881.
4. Gersuny. Centralbl. f. Gyn., 1900, p. 1281.
5. Pfannensteil. Ibid., 1901, p. 33.
6. Veit Handbuch der Gynäkologie, vol. ii., p. 127. Wiesbaden, 197.

THE USE OF THE RÖNTGEN RAYS IN SKIN CANCER, ETC., WITH REPORT OF A CASE.

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Dating almost from the discovery of the Röntgen rays there have been occasional reports made of their use in the treatment of different forms of chronic skin troubles, notably eczema, lupus vulgaris, sycosis, favus, etc.

In 1897 Dr. H. Kaposi[1] showed a patient to the members of the Vienna Dermatological Society upon whom exposure to the rays had caused the hairs of an extensive nævus pilosus to fall off. For a time after the exposure there was an erythematous rash which did not cover all portions of the skin acted upon alike. It was suggested that the action of the rays was due to the chemical effect of the ultra-violet rays producing hyperæmia, and, finally, a paresis of the bloodvessels. It was believed that when the bloodvessels regained their normal tone the hair would be restored, which proved to be the case. In 1898 Dr. Kummel exhibited before the Congress of the German Society of Surgery two cases almost cured of lupus. In 1899 Drs. Castel and Faveau de Courmelles[2] reported two cases of lupus which were so much benefited as to greatly encourage them. Sittings of ten minutes, three times a week, extending over a month, were given without result, but when currents of greater frequency were employed an energetic reaction was noticed, and improvement occurred.

Albero Schönberg,[3] in 1899, refers to two instances of lupus, one cured after eight months by the rays applied mildly for twenty minutes daily. In the second case reaction occurred after five sittings, the case getting well after six months.

Kummel reports further in this year, having treated eight more cases. He says the rays have some peculiar action directly upon the nodules, the dermatitis playing no part in the cure. He regards the treatment as a decided improvement over the older methods of treating the disease.

In the same year Jutassy reports forty cases, and Schiff and Freund seven cases of hypertrichosis, in which a sufficient time had elapsed to make sure the hair would not grow again.

Dr. C. L. Leonard, the same year,[4] thinks the results mentioned are to be accounted for by the electrical stimulation from the static field surrounding the tube, and not by the effect of the light itself. He endeavors to prove this by saying that if the part is protected by an aluminium shield which collects the electricity and carries it off by a wire to the ground, no effect is produced. His position is scarcely tenable when we consider that the shield also shuts off the light and that the same effect can be produced with the shield alone, no ground wire being used. I might add, also, that I have subjected the skin to several minutes' exposure to a much greater amount of static electricity than is ordinarily used in the X-ray, without producing any reaction whatever.

[1] Wiener klinische Wochenschrift, No. 14, p. 375.
[2] Journ. des Maladies Cutanees.
[3] Fortschritte der Roentgen strahlen, 1899, Bd. i. Hefte 2 und 3.
[4] American X-ray Journal.

Thompson[1] says that the best effects are produced upon the skin by low-vacuum tubes, a fact which I can myself confirm.

Holland[2] reports a chronic eczema of the back of the hand cured by five applications of the light. The same writer reports a case of lupus cured in the same way. The hair was lost, but grew out again.

Mackary[3] reports two cases of chronic eczema greatly benefited by using the light at a distance of four inches ten minutes each day for one month. This I believe to be too strong for the ordinary case with the improved instruments now in use.

In 1900 Albers reports two cases of lupus, one of the ali nasi and the other of the cheek, cured, respectively, in eight and six months. He advises the mild use of the remedy, and cautions against inflammatory reaction.[4]

Kummel, in 1900, increased his cures to sixteen, his favorable results having come after from one to six months' daily exposures at a distance of from 20 to 40 cm. He advised avoiding all irritation of the skin. Schiff further reported good results, but advised that no reaction be produced.

Gassman and Schenkel[5] report a case of non-parasitic sycosis cured by the X-ray.

Stenbeck, of Stockholm, 1901, reports a case of rodent ulcer of the tip of the nose which was cured after the second reaction had been produced.

There appeared in the *Philadelphia Medical Journal* for February 1, 1902, a contribution of my own, reporting four cases of epithelial skin cancer and one case of sycosis non-parasitica cured by the X-ray.

The method employed was to cover the healthy skin with thin sheet-lead and to expose the sore or part to be treated for five minutes at eight inches the first day, increasing the time of exposure and shortening the distance each day until a decided inflammatory reaction was obtained, a low vacuum tube giving a soft light being used. I have been unable to obtain any benefit in any case of the kind without an inflammatory reaction. From my reference to Dr. Leonard's views upon the subject I think it can be seen that it is not the static charge which produces the effect. It then remains to be decided as to whether the inflammation causes the death of the cancer cells and tuberculous deposits, or whether the effect is produced by the light itself. My own opinion is that it is the light. Simple inflammation has often been caused by caustics in and around these sores of lupus and epithelioma without producing the death of the process. I am of the opinion that

[1] American X-ray Journal, November, 1898.
[2] British Medical Journal, April 15, 1899.
[3] British Journal of Dermatology, April, 1899.
[4] Fortschritte a. d. Gebiete Roentgen strahlen, p. 1.
[5] Ibid.

a light sufficiently strong to produce an inflammation of the healthy cells of the part treated is of sufficient strength to destroy cells of lower vitality, as cancer cells are known to be. Whether the point brought out at the Vienna Dermatological Society that the effect upon the skin was produced by the ultra-violet rays is true or not remains to be proven. One thing is certain, the ground taken by Thompson that the low vacuum tube produced more effect upon the skin than the high vacuum tube is well taken.

This might help to substantiate the statement that the effect is from the ultra-violet rays, as they are given off more freely from a low-vacuum tube.

FIG. 1.

Since I reported the above-mentioned cases to the *Philadelphia Medical Journal* I have treated another case of epithelial skin cancer affecting the cheek and lower eyelid. It first appeared about three years ago near the outer corner of the right eye, and grew slowly for a year and a half. It was examined by Dr. Jerome Anderson, of San Francisco, who pronounced it epithelial skin cancer, and by whom the sore and a considerable area of healthy skin around it were removed, the denuded area being partly covered with a patch of skin taken from the cheek further back toward the temple. For a few months the growth seemed arrested, the operation being to all appearances a success. However, about a year ago, the patient noticed a little sore in the edge of the scar near and just below the corner of the eye. This gradually grew, eating away the lower eyelid, as will be seen in Fig. 1. The conjunctiva covering the eyeball below the sclerocorneal junction was very much reddened and thickened.

The diseased process extended from the inner to the outer canthus, and for a distance of an inch and a half down the cheek. It was of the depth of one-fourth of an inch, apparently being very close to the

FIG. 2.

FIG. 3.

bone. He was given the treatment as indicated above for a period of two weeks. The diseased area and one-half inch of the healthy skin around it was exposed. The eyelid was held up with rubber adhesive plaster, and the exposures were made as high as the sclerocorneal

junction, the pupil of the eye and the rest of the face being protected by a leaden mask. The treatments were begun at five minutes, at eight inches' distance, and gradually increased to twenty minutes at four inches, when a decided reaction occurred.

This followed the fifteenth treatment. Fig. 2 shows the same case two weeks after, and Fig. 3 at one month after the last treatment. The sore is perfectly healed, and the redness of the conjunctiva has disappeared except such as would naturally follow having it exposed, from absence of the lower lid. The dark spot seen in Fig. 3, just at the lower edge of the eyeball, is a fold of mucous membrane.

NOTE.—By permission of Dr. M. Gardner, Surgeon-in-Chief of the Southern Pacific Railway, I mention a case of keloid of the breast which I was allowed to examine before and after the same had been treated after the manner laid down in the present article. The growth entirely disappeared after it had undergone inflammatory reaction, which occurred after the sixteenth treatment.—J. F. R.

A REVIEW OF THE SURGICAL DISEASES OF THE GALL-BLADDER AND GALL-DUCTS AND THEIR TREATMENT.

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THERE is a growing tendency to place the affections of the biliary apparatus in the category of surgical diseases, for the surgeon who actually observes their phenomena should have a better grasp of the situation than the casual observer of the conditions seen in the dead house. Moreover, the necessity of surgical intervention is now plainly recognized for many conditions which were formerly only treated by procrastination and the encouragement of the opium habit. As yet in this country biliary surgery is still on an unsatisfactory footing, as the medical public is apt to form its judgment from the results of operative interference in grave cases with a necessarily serious prognosis. The surgeon, however, has not the choice of cases, but has to do his work on the material presenting itself. The future of gallstone operations especially should be in the nature of milder or prophylactic operations. To attain this end the internist must co-operate with the operator, and both come to an intelligent appreciation of each other's views.

The field of biliary surgery has of late become extensive and at the same time better defined. From a clinical stand-point it is fairly easy to group the disorders amenable to surgical treatment, as many of the

diverse lesions seen post-mortem need not be considered except collectively.

Classification. We can here disregard the subject of traumatisms of the biliary apparatus which are to be treated on general surgical principles—arrest of hemorrhage, repair of essential structures, and prevention of extravasation of visceral contents.

We distinguish then four groups of biliary disease:

Inflammatory diseases.

Calculous diseases.

New-growths.

Obstructions other than gallstones.

General Symptomatology of Diseases of the Biliary Tract. The symptoms of certain morbid states of the biliary tract are most clearly defined both as to the nature and the site, for example, of the impaction of stone in the common duct; in others the symptoms may be almost null or latent, *e. g.*, gallstones lying quietly in the gall-bladder for years. Again in others, the differential diagnosis from diseases of contiguous organs is very difficult or impossible, *e. g.*, adhesions of the gall-bladder may give rise to a chain of symptoms and confusing physical signs that make a distinction from malignant disease of the stomach impossible.

Symptoms are both local and general, and in some cases a very probable diagnosis can be made from either independently of the other, *e. g.*, the constitutional reaction manifested by irregular chills and fever, of impacted gallstones, or the localized tenderness over the gall-bladder in empyema—the typical attack of colic or the fluctuating or sudden jaundice due to impaction of a stone in the common duct.

General Diagnosis of Biliary Affections. Three problems are concerned: 1. Diagnosis from affections of other organs. 2. The variety of lesion in the biliary tract. 3. The site of the disease.

The possible confusion with disease of other organs is almost infinite, as no part of the body is richer in possibilities of obscure and severe disease than the upper right quadrant of the abdomen, "the future playground of the surgeon," one of my friends calls it. To exhaust all the possibilities cannot be undertaken here. It is perhaps best to divide them into two main though necessarily artificial groups; those most closely resembling disease of the biliary apparatus and the more remote.

1. (*a*) Diseases of the liver in general, chiefly hypertrophic cirrhosis, carcinoma, abscess. (*b*) Of the pancreas in all forms. (*c*) Of the kidney, chiefly renal colic and floating kidney. (*d*) Of the stomach, gastroptosis, ulcer, carcinoma. (*e*) Of the intestine, chiefly appendicitis and gastroduodenitis, and tumor of the duodenum.

2. Diaphragmatic pleurisy, subphrenic abscess, intercostal neuralgia, mesenteric growths, peritonitis, local or tubercular; intestinal obstruc-

tion, lead colic, inflammatory and other diseases of the pelvic organs in the female, and tumors and inflammatory processes of the abdominal wall.

Of all the elements of differential diagnosis, none is so valuable as a detailed and searching history; by it alone several typical forms of biliary disease can be diagnosed with a reasonable certainty, *e. g.*, impaction of a stone in the common duct, a combination of the three cardinal symptoms, typical attacks of colic, typical chills and fever, and typical jaundice (sudden onset, variations). In the absence of positive physical signs or in the presence of confusing or contradictory signs the history must be the final arbiter. Only brief mention can be made here of the distinguishing signs of some of the more important diseases that may be confused.

(*a*) Hypertrophic cirrhosis with jaundice may sometimes be difficult to distinguish from jaundice due to obstruction of the common duct or from compression by a tumor of the head of the pancreas; but generally the evident physical signs and absence of palpably enlarged gall-bladder (in compression by tumors) with other signs will make the situation clear. Carcinoma of the liver—usually secondary—and careful examination will often reveal primary focus—stomach, rectum; physical signs of isolated cancerous foci on the surface of the liver are generally evident. Abscess of the liver may closely resemble cholangitis or empyema of the gall-bladder; in obscure physical signs reliance may have to be placed on etiological factors (chronic dysentery, septic processes), the use of the aspirating needle introduced into those parts of the liver where such exploration is ordinarily safe, and the detection of peptones in the urine.

(*b*) Pancreatic disease causing blocking of the common duct is so intimately associated with biliary pathology that it will be considered under diseases of the biliary apparatus (obstruction other than calculous disease).

(*c*) The kidney; a right floating kidney is easily mistaken for a distended gall-bladder (obstruction of the cystic duct) or *vice versa*, a mistake which might almost be called classical. Chief distinguishing sign, the kidney when reduced into the flank stays there, the gall-bladder springs back. Renal colic—the history, typical pain running *downward*, and the urinary examination, should decide the point.

(*d*) Extensive inflammatory adhesions around the biliary tract, especially when the stomach becomes involved in them, frequently give rise to conditions which, neither from the history, symptoms, nor physical signs, can be satisfactorily distinguished from lesions of the stomach, particularly carcinoma or ulcer. Ordinarily the history, disturbed state of the gastric functions, the examination of the gastric contents, the preponderance of physical signs in the mid-line or to the left of it, suffice to distinguish these conditions. Gastroptosis resembles the

vague gastric manifestations of milder gallstone disturbances. Its characteristic physical signs and its common associated conditions, especially floating kidney, generally distinguish it.

(*e*) Recently attention has been called to the confusion often existing between attacks of cholecystitis (with or without stone) to appendicitis, especially of the relapsing type. Actually the appendix may be so abnormally situated (non-descent of the cæcum) or so long, and running upward and inward, as to render it quite impossible from the standpoint of location to distinguish between the two. The greatest difficulty is in the height of an attack when there is general tenderness and rigidity over the entire right side. Ordinarily by very careful and delicate palpation we can assure ourselves that the *intensity* of the tenderness is either high or low, and distinguish accordingly, always bearing in mind that the situation of the pain and tenderness over the gall-bladder are constant factors. A high leucocytosis would favor a diagnosis of appendicitis from milder forms of biliary caculus, but would not help in the case of empyema of gall-bladder or cholangitis; but in these severer forms there would ordinarily be physical signs of a distinguishing nature.

Gastroduodenitis ordinarily is not difficult to distinguish; it is accompanied by evidences of intestinal disturbance, is usually acute in its onset and course, pain is not a prominent feature, and usually only excited by the process of digestion, the jaundice generally comes on suddenly, and is usually well-marked and out of proportion to the mild constitutional symptoms. Observation for a few days will usually throw the necessary light on an otherwise obscure case. (For tumors of the duodenum, see below.)

The second group is mentioned only for the purpose of completeness, as these diseases should not ordinarily be confused. The nature and site of intrinsic disease of the biliary tract comes properly under the consideration of the several varieties. A few comments may be in order on some of the features common to many or typical of some.

The history is always of the first importance.

Etiology. This is more a question of predisposition or liability to disease.

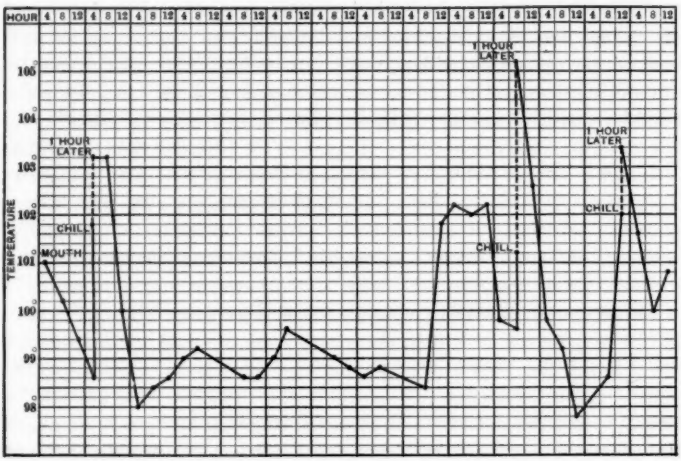
Of late certain observers have been impressed with the possibility of hereditary tendencies toward gallstones. The real explanation is more probably in the habits common to families or communities. The preponderance of gallstones among mature and elderly females, especially in the leisure classes and those of sedentary habits, is quite marked. New-growths, while occasionally observed in younger persons, should always be borne in mind in elderly persons, especially when symptoms first develop in late life, that is, if there is no history of occasional biliary symptoms covering a period of years.

INDIVIDUAL SYMPTOMS. *Pain.* This is both subjective and that elicited by pressure—properly speaking, tenderness. It may be of various kinds, definitely located or vague, may be confined to one spot, or radiate in various directions, may be constant or intermittent. May be entirely absent, may be sudden in its onset or termination, or may be slow to develop, may be characteristic of disease or of location.

Tenderness over the gall-bladder region, even when the gall-bladder is not palpable, is of very varying degree, but is practically always present if there is any considerable degree of cholecystitis with or without stones. Marked tenderness points to active inflammation or empyema of the gall-bladder. Pain radiating from the gall-bladder backward and toward the right shoulder may indicate that the stones are still confined to the gall-bladder, radiating toward the left, generally points to the location of the stones in the common duct. Colicky pains of sudden onset, of variable intensity, but usually of a severe or agonizing type, point to the presence of stone in the common duct in process of working its way out; very sudden remission of the pain generally indicates its escape. Diffuse pain and tenderness over the biliary apparatus, especially if attended with severe constitutional symptoms, generally indicate a diffuse cholangitis. Surprisingly marked degrees of cholelithiasis may exist with only very infrequent and mild pain, described as crampy, needling or knifing according to severity. The gall-bladder may be full of stones, there may even be some in the common duct without the person ever having had his attention called to the slightest painful sensation.

Fever. May be entirely absent at all stages, may be only occasionally present; may be very slight, may reach high degrees, may be constant, may have intermissions, either frequent or infrequent. It seems dependent on two elements—infective reaction and nervous influences. Gallstones when remaining quiescent in the gall-bladder ordinarily give rise to no feverish reaction, and if the latter does occur, it is due to the cholecystitis. Mild grades of cholecystitis give rise to moderate febrile disturbances, not usually exceeding 102° F., and exhibiting tendencies to remissions and exacerbations much like chronic recurring appendicitis. A considerable degree of fever running a steady course, with little or no remission, especially if accompanied with local tenderness and constitutional disturbances, indicates an empyema or diffuse cholangitis; it may also be marked by chills and remissions. The temperature elevations, with chills and remissions commonly seen in impaction of a gallstone in the common duct, especially when it is moving, or the duct is in an inflamed condition, are very typical, and usually settle the diagnosis, or may of themselves make it. When accompanied with typical colic and with jaundice, more especially if this is of a fluctuating character, the diagnosis is absolute.

Ordinarily there will be a fairly marked chill, followed by a rapid elevation of temperature—104° to 105° F. The temperature generally falls abruptly in a few hours. The chills may be repeated several times in twenty-four hours. There are usually irregular intermissions. There may be one or more chills every day for several days, and then intermissions for one or two days or longer. They are essentially *irregular*, which serves ordinarily to distinguish them from the malaria for which these unfortunates generally get treated until or unless the jaundice appears, which makes the diagnosis so clear that it hardly can be



Temperature chart of patient suffering from impaction of a stone in the common duct.

missed. Actual chills may not occur, although the abrupt temperature manifestations may be just as typical, or the patients notice only mild or temporary cold or "creepy" sensations. Whether the temperature remains at or near the normal level during the remissions depends on the degree of inflammatory disturbance of the biliary tract present.

The exact exciting influence of these characteristic chills is not plain. They are often alluded to as of "nervous" origin and compared to urethral chills. The latter, however, are so closely associated with septic disturbances of the urinary tract, having become infrequent with consistent asepsis, that one must look more to the septic origin for their explanation.

For all that, this picture of irregular fever and chills is so typical of impaction of stone, it is of the utmost importance to bear in mind that not infrequently all those manifestations may be absent or may be so

slight or so rare an occurrence as to have no value for diagnosis. That is, absence of this chain of symptoms does not exclude the presence of stones in the common duct.

Jaundice. This may vary from slight tinging of the conjunctivæ to the deeper shades of green-black. It may come suddenly or slowly; it may begin to disappear quickly (the process does not subside at the same rate as it may begin) or only very gradually; it may show a steadily progressive stage, or it may fluctuate and remit or remain unchanged. Two essential diagnostic points are learned by the jaundice and its mode of onset and behavior. Broadly speaking, its absence or presence distinguishes between processes limited to the gall-bladder (and cystic duct) and obstruction of the common duct from within or without. A rather sudden onset favors the diagnosis of stone; if there is a *certain* history of remission it makes it practically absolute. Steady progressive jaundice, *never* remitting, points more to compression from without, chiefly due to growth or other disturbances of the pancreas. The very severest jaundice is usually seen in the latter form of obstruction rather than stone. Very deep jaundice, without history of colic, absence of fever, and with a gall-bladder that can be palpated indicate compression, and not stone obstruction, with reasonable certainty.

Jaundice occasionally develops as an inflammatory manifestation of the condition of the common duct. A stone confined in the cystic duct may cause jaundice, if of large size, by pressure on the common duct.

The Size of the Gall-bladder. Three conditions are especially characterized by enlargement of the gall-bladder. Acute suppurative inflammation, dropsy of the gall-bladder—the cystic duct being permanently blocked—and *compression* of the common duct from without, chiefly by disease of the pancreas. An acute cholecystitis, more especially an early attack, may have a visibly enlarged gall-bladder; in recurrent attacks the gall-bladder is generally of small size, shrunken, and with thickened non-dilatable walls. So that with impaction of a stone in the common duct, when there has probably been considerable antecedent disease of the gall-bladder, the latter is commonly not to be felt. On the other hand, an easily palpable gall-bladder, with marked jaundice, points strongly to compression of the duct, chiefly by tumors of the head of the pancreas.

The carcinomatous gall-bladder may or may not be felt.

The clinical test of an enlarged gall-bladder lies in its recognition on palpation. The expertness of the examiner and the patient's bodily condition are variable conditions. Light superficial palpation with the finger-tips will more readily identify the gall-bladder than deep palpation. The resiliency of a distended gall-bladder is generally evident. That a gall-bladder feels dense and nodular does not necessarily imply a carcinoma, as precisely the same feeling may be imparted by a gall-

bladder tightly packed with stones. Masses of adhesions may also give a deceptive tactile sensation.

The enlarged bladder may point in several directions, ordinarily its fundus is found projecting forward from under the liver in the mammary line. A gall-bladder may be very large, and yet be directed more laterally and concealed by the normal liver; or it may, though of great size, be entirely hidden by a large liver. A "large" gall-bladder is about the size of two fists; it may attain practically unlimited size; it has been mistaken for an ovarian cyst.

The use of the aspirating needle for exploring the gall-bladder prior to opening the abdomen is absolutely unjustifiable.

Gallstones in the Feces. From time immemorial the finding of gallstones in the stools has been thought to be of value, both as to diagnosis of the existence of gallstones, and as to their results, it being held, for instance, that the finding of a stone after an attack of colic signified that the source of trouble had been eliminated. My own feeling is that the search for gallstones in the stool has but little value, as we only learn what has happened to that particular stone which no longer interests us, and fails to throw any light on future possibilities.

X-rays of Gallstones. Some observers have published successes in the detection of stones by the aid of the Röntgen rays. I have had a number of radiographs made of removed gallstones, these observations and the opinions furnished me by experts in radiography lead me to doubt that we can at present include this method among our diagnostic aids.

The Various Forms of Biliary Disease. *Inflammations.* (*a*) Empyema of the gall-bladder. (*b*) Cholangitis. (*c*) Acute and chronic cholecystitis.

These forms occurring independently of gallstone formation are rare, and consequently will not be given much space. Finer distinctions of kind and severity may be drawn; but these are the essential processes, varying in the intensity of their effects. Their general etiology is probably the same, and must be ascribed almost wholly to infection from the intestine, chiefly colon and typhoid bacilli.

(*a*) Empyema of the gall-bladder, a general term which I use for processes varying from simple purulent catarrhal inflammation to ulcerative and phlegmonous processes. The symptoms are local and those of constitutional sepsis. The treatment should be prompt, free drainage with abundant protection of the peritoneum by gauze packing—exceptionally cholecystectomy.

(*b*) Cholangitis is practically the same process applied to the bile-ducts, the infection generally proceeding from the intestine, its essential danger is in the extension to the intrahepatic ducts and fatal sepsis. In well-established cases it ranks among the most dangerous and fatal condi-

tions. Marked constitutional disturbances exist, local pain, jaundice, and more or less swelling of the liver. The prognosis is bad.

The treatment consists in cholecystotomy and drainage, according to the severity and extent of the symptoms; if extreme, drainage of the common or hepatic duct may be indicated.

(*c*) Simple cholecystitis may be acute or chronic. It represents mild inflammatory reaction of the mucous membrane of the gall-bladder, the cystic duct may be involved and become permanently altered, in the latter case the gall-bladder remains permanently distended, secreting a clear mucous fluid. The condition is subject to remissions and exacerbations. The symptoms are mild, the constitutional being in general insignificant or transitory. Locally pain and the presence of an enlarged gall-bladder are noticed. The treatment is either palliative (hygienic) or, if repeated, curative, preferably by cholecystectomy if the gall-bladder can be easily extirpated, otherwise cholecystotomy.

Biliary Disease Due to Formation of Calculi. From the clinical and therapeutical stand-point the importance of gallstones overshadows the entire field of biliary pathology, and, with the exception of cholecystenterostomy, practically all the operations have been directed to their relief. The causative factors of gallstone formation cannot be definitely stated. My own belief is that infection of the biliary tract, especially of the gall-bladder, results in a primary process, the effects being manifested by alteration of the bile and resulting deposit of biliary salts. Bacteria can almost always be found in gall-bladders containing calculi. Bacteria are also found in the *interior* of gallstones quite frequently, and would be oftener found but for technical obstacles. In addition there is the element of predisposition to the deposit of biliary salts; whether this is a seeming primary process, or simply due to the inherent disposition of the individual to the receipt of infection, seems to me to be unsettled. That the stagnation of bile in the gall-bladder is an important factor seems to be certain, and we may simply have to take into consideration those elements of the individual's habits which favor this stagnation. Some of these may be referred to faulty, irregular or infrequent digestion which provokes the flow of bile. Sedentary habits seem also to be a definite favoring element. Other alleged etiological causes are many, but generally fanciful and devoid of any great probability.

Characteristics of Gallstones. Cholesterin usually forms the base of gallstones, to which may be added bile pigments, salts of lime, mucus and other organic substances. They are usually dark-colored, and may be black. They may be crystalline or amorphous in shape, they may be dense (never to the extent of urinary calculi), or soft or brittle. They may be faceted, especially if of a regular shape. Their size varies greatly from fine sand to a hen's egg, or larger, their number

varies up to the thousands. Examination of their nuclei will frequently show bacteria in them.

Location of Gallstones. The vast majority of stones occupy the gall-bladder and originate in it. Stones formed within the intrahepatic ducts are generally of small size, and, according to Langenbuch, of a different chemical composition, and rarely cause mechanical disturbances, though very exceptionally a large stone may form in and block the hepatic duct.

Stones have a tendency to escape from the gall-bladder into the cystic and common ducts, where their effects are more severely manifested. Stones probably remain quiescent in the gall-bladder until some expulsive efforts are made by an inflamed gall-bladder to get rid of them. It is this process that probably gives rise to the minor degrees of pain, the "crampy, needling" variety. Blocking of the cystic duct by stone, while not producing serious disturbance, is apt to prevent the flow of bile into the gall-bladder and the exit of its secretions, and there is frequently a resulting "dropsy" of the gall-bladder. The stone having been passed out of the gall-bladder is one step nearer toward the common duct where its maximum of damage can result.

When a stone has passed into the common duct the result may be threefold. The stone may be in the duct either free or fixed, without causing *definite* manifestations; it may not interfere with the passage of the bile, nor set up inflammatory changes. It may be expelled usually after considerable effort manifested by biliary colic and its attendant symptoms; it may, if small, and occasionally when large, be expelled with little or no attendant symptoms. Or the stone may become impacted and completely block the common duct, causing jaundice, which may vary in its intensity according to the degree of completeness of the obstruction, or if the stone shifts and allows the occasional escape of bile, or if there is contributory blocking from the swollen inflamed mucous membrane which may undergo remissions. The stone may be anywhere in the duct, but the commonest place is in the retroduodenal portion, just before the duct enters the intestine, or it may actually be wedged in the mouth of the papilla.

The size of stones found in the common duct varies, a comparatively small stone with diameters not exceeding a quarter of an inch may cause complete blocking. The stones that do the mischief will run commonly about the size of a filbert, though they may attain an enormous size (hen's egg and larger). The number varies, it is rare to find more than three or four, usually there are one or two (the latter is commonest in my experience).

Gallstones may leave the biliary tract in many ways beside the normal exits, and this escape may take place from the gall-bladder or from the ducts, a suppurative process, perforation or fistulous com-

munication preceding the passage. They may perforate in almost any direction and show themselves in the most bizarre places, and be vomited or coughed up. Generally this perforation takes place from the common duct after ineffectual attempts to pass through naturally. The escape is more often into the intestine, chiefly the small. Such stones may cause intestinal obstructions (the reader is referred to the writer's paper on "Intestinal Obstruction," in *Annals of Surgery*, October, 1900), especially when they arrive at the cæcal valve; they generally have added to their bulk while in transit.

The symptoms and consequences of gallstone disease vary according to their location. Both their symptoms and sequelæ also vary according to the degree of inflammatory disease present in the biliary tract. It is thus evident that a general symptomatology of gallstone disease presents too varied a picture to have any degree of accuracy, and the symptoms are studied to the best advantage in the consideration of the individual lesions. I follow here closely the classification and tabulated data given by Hans Kehr; not that I believe that the refinements of distinction made by him are always feasible for the ordinary individual, but because his work represents the highest standard of the present day, which we should strive to attain so far as possible.

1. *Stones in the gall-bladder with slight, if any, or quiescent lesions of the gall-bladder.* Symptoms are very slight, if any; there may be an antecedent history of cramp or vague gastric disturbances. Examination may be negative, or slight pressure elicits some tenderness. The gall-bladder will very rarely be palpable so long as the cystic duct remains patent.

Treatment. In the present attitude of the profession toward gallstones, operation will not ordinarily be advised. Certainly it will not be entertained for those persons upon whom we ordinarily do not care to perform operations. In younger individuals of fair health, I think we shall eventually recommend operation on the principle of prophylaxis. For here we have much the same indications as exist for mild degrees of chronic appendicitis. The interval operation is so simple and innocuous, while the enforced operation during the attack has so many disagreeable possibilities that it is worth running the risk of performing an operation for a trouble which may never prove serious. Cholecystotomy or cholecystectomy, according to the indications, and the conditions actually found at operation.

2. *Stones in a gall-bladder previously obviously inflamed; cystic duct temporarily patent; adhesions.* In this condition the symptoms are not much more distinct, but somewhat intensified, especially when there is lighting up of the cholecystitis, the cystic duct perhaps becoming kinked with distention of the gall-bladder. Locally one can palpate the gall-bladder, especially during the height of the attack.

As regards treatment, the indications are somewhat more pronounced than in the preceding; extirpation of the gall-bladder particularly, if the trouble is long standing, seems the preferable operation.

3. The same condition without stones, but with particularly marked adhesions. The symptoms are about the same. Kehr says the pain may be elicited by change of position, straightening up.

The condition to my mind is of considerable gravity, as the adhesions may produce marked changes and disturbances of the biliary tract and of neighboring organs, particularly the stomach, physical signs being produced very closely resembling ulcer and carcinoma and attended with many of the disturbances and symptoms of these diseases. Conversely an apparently advanced case of pyloric obstruction may be due to adhesions from the gall-bladder and may be cleared up and cured as the result of an exploratory operation.

Treatment. Obviously the best method of treatment would be extirpation of the gall-bladder, but it might be wiser, on account of technical difficulties, not to attempt it, but to compromise with cholecystotomy and drainage.

4. *Acute cholecystitis in a relatively healthy gall-bladder—usually a large stone impacted in the neck, exudative inflammation. Symptoms.* The symptoms heretofore given are exaggerated and acute. In addition we have the enlargement and tenderness of the gall-bladder as constant and marked quantities. The picture, both local and general, is influenced by the relative degree of infection (cholangitis), and, if marked, the constitutional symptoms may be alarming. The presence of the enlarged and tender gall-bladder should make the diagnosis evident.

The treatment is operative, though one may exercise some judgment about tiding the patient over the acute attack and operating in the quiescent stage—the stone probably remaining impacted; if it does not so remain, it will probably have passed and lodged in the common duct. The choice of operation is about the same as in No. 2, with extraction of the stone.

5. *Acute exacerbation of long standing chronic cholecystitis; obliteration (stricture, kinking, adhesions) of the cystic duct, mucopurulent exudate; surrounding adhesions. Symptoms.* The gall-bladder wall being thickened from previous attacks does not dilate, and the gall-bladder is not felt, as it lies well up under the liver. Tenderness over the site of the gall-bladder can be elicited. There will be remission and exacerbation of symptoms which will not usually present the severity or acuteness of the preceding form.

The diagnosis will be difficult on account of the absence of the valuable diagnostic sign of enlarged, painful gall-bladder; the condition may be mistaken for many things: colic, typhoid fever, malaria, sepsis (Kehr).

The treatment is certainly operative, as there is little reason to believe that medical treatment will influence so well-marked a condition. Again, the decision will be between cholecystotomy and cholecystectomy, the technical obstacles may be very marked for either operation and particularly the latter, and will influence the choice between them. If we do a cholecystotomy we may not, and probably will not, be able to stitch the gall-bladder to the abdominal wall (see below under description of cholecystotomy).

6. *Dropsy of the gall-bladder; cystic duct either non-patent or blocked by stone; contents of the gall-bladder non-inflammatory, clear sterile fluid, marked thinning of walls. Symptoms.* These are slight or may be wanting; but the presence of the dilated gall-bladder is evident. The peculiar tongue-shaped enlargement of the liver overlying the gall-bladder (Riedel's lobe), which is often seen after continued gall-bladder irritation may be noted.

Diagnosis. The marked distention of the gall-bladder is the essential feature, but the tumor is so freely movable (absence of all inflammatory adhesions) as to give rise to many mistakes. The classical one is to believe it to be a floating kidney (which has happened to many operators, including myself), as the tumor may often be readily pushed up into the right flank. It, however, tends to return forward again while the kidney stays in place.

The treatment is operative. Cholecystotomy, if the cystic duct is obliterated from causes other than calculus, will not restore the physiological function of the gall-bladder, so that the bladder being no longer useful might as well be removed. If there is a stone in the cystic duct that cannot be dislodged into the gall-bladder, it is better to amputate the gall-bladder and close the cystic duct after removal of the stone. Should one decide not to remove the gall-bladder the incision in the cystic duct may be drained or sutured. Cholecystectomy is here the operation of choice in my belief, as it should ordinarily be very easy to perform, and more completely meets the indications.

7. *Empyema of the gall-bladder with stone in the cystic duct and adhesions.* The earlier stage presents the picture of an acute cholecystitis (No. 4); if remission takes place, the later aspect is that of dropsy of the gall-bladder (No. 6), though the dilatation of the gall-bladder will not be so marked. The symptoms vary with the intensity of the process and whether there is extension beyond the limits of the gall-bladder. In the latter case we have the manifestation of peritoneal irritation up to the extreme degree of perforative peritonitis. The process may undergo spontaneous remission if of not too pronounced type.

The treatment varies from palliative during the height of the attack to cholecystotomy and cholecystectomy, the decision resting on the actual findings.

8. *Acute obstruction of the common duct by stone.* This type is of brisk onset and great severity, with marked jaundice, fever, chills, vomiting, and "biliary colic."

The essential symptom is the agonizing, unbearable pain, it usually only lasts some hours, the stone making its way to the duodenum, or if it fails to pass, the pain and constitutional disturbance subside after a time, probably as a cessation of the expulsive efforts of the common duct, and it then becomes an impacted stone. There is ordinarily no doubt about the diagnosis. The treatment is entirely palliative, the use of anodynes—in extreme cases temporary or partial general anæsthesia—to counteract pain and spasm. One must remember that large amounts of narcotics may be tolerated during the height of the pain, but on its cessation the natural susceptibility returns and may have pronounced effects.

Kehr says that in exceptional cases the hepatic duct might be drained.

9. *Chronic obstruction from impaction of gallstone.* The condition varies according to the actual amount of obstruction, and may be influenced by temporary or sudden changes either in the position of the stone or of the condition of the mucous membrane of the duct.

The symptoms vary accordingly—they may be wanting, incomplete, or intermittent. In marked and typical cases we have pain subject to exacerbations and radiating toward the umbilicus, jaundice (with clay-colored stools and dark urine) of considerable intensity; but usually the orange color rather than the green-black often seen in permanent compression of the duct by tumor; there is the intermittent fever, already fully described under general symptoms. The gall-bladder, although containing stones, generally gives no physical sign unless it is tenderness on pressure over its site, as it is of the atrophic type characteristic of frequent antecedent attacks of cholecystitis. This non-evidence of the gall-bladder is an important physical sign when other characteristics are wanting in making a differential diagnosis from obstruction due to compression of a tumor, especially of the head of the pancreas.

The course of this affection may be and is usually chronic, especially of the milder type with remissions of symptoms. The severer form with marked jaundice is fatal from cholæmic poisoning. Spontaneous termination by the expulsion of the stone is possible, but always problematical, in a given case, and it is more rational to believe that the chances are against it. The problem may be solved by the perforation of the stone into the intestine or otherwise. Sometimes this process has happy and uneventful results, but the disagreeable possibilities which are the more probable should not lead us to await this outcome with equanimity.

The treatment is operative; it represents severe and difficult measures made the more hazardous by the bad condition of such patients who are reduced in strength by prolonged illness and suffering. Many of them have become morphine habitués, which is a grave complication. The jaundiced condition is also a very serious matter, especially as it tends frequently to a hemorrhagic state, so that without division of visible vessels we may have profuse and even fatal bleeding, the hemorrhage occurring in any tissues, the abdominal wound (I have lost a case with an enormous hæmatoma infiltrating the muscular layer), from separation of adhesions, or from the incision into the gall-bladder or ducts, or from the mucous membrane lining the ducts. It also tends to recur so long as the jaundiced condition lasts.

The operations are: (*a*) Crushing a friable stone in the common duct without opening the gall-duct—a procedure that will and should be very seldom resorted to; (*b*) choledochotomy or choledocho-duodenostomy. The conditions met with in the gall-bladder will have to be treated according as they present themselves; it will seldom be necessary to make a direct incision in the cystic duct, for any stone impacted in it can ordinarily be removed through the opening in the common duct.

M. H. Richardson recommends increasing the coagulability of the jaundiced patient's blood by the administration of ox-gall, lime-juice, and similar remedies. The coagulability of the blood is tested periodically by counting the time it takes to coagulate after withdrawal from a vein.

New-growths of the Biliary Passage. Cancer of the gall-bladder is the only new-growth found with any frequency, the others being so rare that we can dismiss them as curiosities whose consideration does not belong in this restricted space.

Cancer is not so infrequent as formerly supposed; it is generally accompanied by gallstones, and these usually precede it. There are no essential symptoms, the accompanying cholelithiasis or cholangitis will usually give the signs we have studied under these conditions. Occasionally palpation will reveal the hard nodular character of the growth.

Treatment, if any, cholecystectomy, with partial resection of liver—an unpromising operation.

Cancer of the Bile-ducts. This is less frequent than that of the gall-bladder; it may occur anywhere but chiefly at the duodenal papilla (see below). The symptoms, if any, depend on the location—if occluding the common duct there will be jaundice. The possibility of treatment is problematical (see below, duodenal papilla), possibly a cholecystenterostomy or choledocho-enterostomy.

Obstruction of the Common Duct from Without. (*a*) Pancreatic disease—this is the commoner of the external sources of com-

pression—it may assume the form of tumor (usually carcinoma of the head). (*b*) Chronic interstitial pancreatitis—the condition formerly called fibroid thickening of the pancreas—or cystic changes in the pancreas.

Pancreatic Disease. Both malignant disease and interstitial pancreatitis have lately been shown to be not infrequent, and, from their relation to the common duct, take a prominent part in the pathology of the biliary-tract.

Neither for tumor of the pancreas nor pancreatitis can a definite symptomatic picture be drawn; pancreatitis is usually attended with antecedent gastric disturbances, and there may be pain or tenderness, or both, over the pancreas. Both in tumor of the pancreas and in pancreatitis, a considerable or total obstruction of the common duct may exist without an enlargement of the pancreas that can be palpated externally, or even (more particularly with tumor of the head) clearly evident on palpating the pancreas during the course of an operation. In a case of pancreatitis[1] which I refer to here several times, the diffuse enlargement of the pancreas could be outlined after the administration of the anæsthetic before opening the abdomen.

In general the diagnosis is made from the presence of jaundice, which never remits, and tends to increase steadily (occasionally it may show a quick increase), with the usual accompaniment of enlarged gall-bladder and the absence of any characteristic signs of other disease, particularly of stone in the common duct—typical colic, *fluctuating* jaundice, characteristic fever.

We do not know definitely the life-history of pancreatic disease. Cancer of the pancreas is apparently slow in its progress and generalization. One of my patients lived comfortably for a year after successful cholecystenterostomy for an undoubted tumor. The patient with chronic pancreatitis, who also was relieved by cholecystenterostomy, has fully regained her health, apparently uninfluenced by the condition of her pancreas, which presented the appearance of a diffuse and considerable hyperplasia; diagnosis confirmed by the microscopical findings of a small fragment removed without sequelæ.

Treatment. If the diagnosis is made beforehand of carcinoma, shall we operate at all, and if so, what may be done? The answer to this question depends on two conditions: at what stage we see the patient, and how sure one is of the diagnosis. If the patient is very ill and extremely jaundiced, any operation, even the simplest, is attended with great danger; one could hardly perhaps think of doing anything but a simple cholecystotomy (with a distended gall-bladder it might be done under local anæsthesia). This operation then would only give the

[1] Transactions New York Surgical Society, October 10, 1901; Annals of Surgery, January, 1902.

patient relief from absorption of bile and implant a permanent fistula upon the already pitiable condition. Cholecystenterostomy is a valuable operation, but is extremely deadly in these cases, not because the operation is in itself so serious, but because the patients cannot stand anything. The operation, however, is not so serious as would ordinarily appear, if it is done as a pre-determined operation, nothing else being undertaken. Cholecystenterostomy is usually fatal because it is generally done as the end-stage of a prolonged exploration in the attempt to separate adhesions, locate stones in the common duct, etc. If the patient's condition is still fairly good, I earnestly recommend operation for several reasons. Even in apparently clear cases the diagnosis of tumors of the pancreas must generally be open to doubt; and it is a pity not to give the patient the benefit of the chance of having a remediable condition. Even if he has a tumor of the pancreas, he will get marked relief by short circuiting of the bile into the intestine, provided he survives the operation; but a "tumor" of the pancreas is not always a malignant growth, and may quite likely be an interstitial process with a good prognosis, if the urgent symptom, the cholæmia, be relieved. So that I believe sincerely in the operation of cholecystenterostomy, provided the patient's condition is not so far advanced as to forbid it.

The biliary ducts, especially the common, may undergo compression by malignant processes of the liver, primary or secondary; they may also be compressed by secondary infiltration of the glands which are normally situated at the union of the cystic and hepatic ducts.

Obstruction of the Duodenal Papilla by Tumor of the Intestine, Originating Near that Point or by a Tumor, Usually Carcinoma of the Papilla Proper. The latter is to be differentiated pathologically into tumor of the bile-duct presenting at the papilla and tumors of the papilla itself. The tumor of the gut proper is more generally sarcoma, and may give also the symptoms of pyloric obstruction. The symptoms of the papillary involvement differ in no way from the type presented by tumor of the pancreas. Either of these conditions may also be complicated with gallstones in the biliary passages, whose symptoms may be the more prominent. In a recent case of choledochotomy and cholecystotomy for gallstones the patient did badly, and no bile passed into the bowel. He died shortly afterward, and an additional obstruction was found, post-mortem, in a small carcinoma of the papilla not detected by palpation during the operation.

Until recently one would have said that there was either no treatment or else cholecystenterostomy for the relief of this source of cholæmia; but both W. S. Halsted[1] and W. J. Mayo[2] have successfully

[1] Boston Medical and Surgical Journal, December 28, 1899.
[2] St. Paul Medical Journal, June, 1901.

removed the duodenal end of the common duct through an incision in the duodenum.

COMPRESSION FROM ADHESIONS. The biliary ducts may be obliterated or compressed from the presence of adhesions secondary to disease of the biliary apparatus, especially inflammatory lesions of the gall-bladder. It has happened sometimes that an operator has failed to find any source of jaundice, and yet the operation has resulted in its disappearance, the adhesions compressing the duct having been relieved by the manipulations incident to its exposure.

OPERATIONS. The general and local preparations of the patient are such as are customary in abdominal surgery. The hemorrhagic tendency inherent on the jaundiced condition has led operators to seek to increase the coagulability of the blood by administering ox-gall and lime-juice as recommended by Richardson. The previous administration of calcium chloride by mouth and rectum has, in my hands, proved unavailing.

The Incision. The practice of operators varies. In general it may be said that there are two, the vertical, directly in the axis of the gall-bladder or along the outer border of the right rectus muscle, and the transverse. Other incisions are merely modifications, as the L-shaped incision, the transverse portion meeting the vertical at its uppermost point, or the ⌐¯-shaped, the upper transverse incision being directed to the left, the lower to the right. The L-shaped incision may be so made that the transverse portion divides only the sheath of the right rectus, the muscle proper being retracted inward. The transverse incision may be made obliquely. Some operators do all their work through a single vertical incision. My own preference is for the transverse incision with division, if necessary, of the sheath of the rectus and inward retraction of the muscle in all cases in which we expect to have to work on the common duct. The wound gapes more widely, the exposure is in the right direction, and the overlying liver can be better pushed away. I have never had any trouble about its repair, nor is there any disposition to hernia in this part of the abdomen. It has a slight disadvantage in being somewhat more bloody.

Cholecystotomy and Drainage. This is the operation most widely practised in biliary surgery. Its indications are numerous: simple or purulent cholecystitis with or without stones; cholangitis, rarely as a merciful relief to biliary obstruction, other and better means being unfeasible or inexpedient. It enters into competition with extirpation of the gall-bladder in many cases, and to which preference will be given depends somewhat on the technical obstacles to cholecystectomy and the operator's individual fancy. It is always the operation of choice when there is any doubt as to the patency of the lower biliary apparatus. It is manifestly of very limited usefulness if the bile cannot

reach the gall-bladder on account of permanent obstruction to the cystic duct.

Prolonged drainage exerts a markedly beneficial influence on the gall-bladder, and usually is curative of the cholecystitis. It has been found that successive tests of the contents of the gall-bladder during the process of drainage show a progressive tendency toward sterilization.

The time of drainage by tube varies naturally from a few days in simple conditions to months in cases of marked suppuration. Discontinuance of the drainage is generally followed by prompt closing of the fistula, if the common duct is free. In some cases a mucous fistula may persist long after bile has ceased to escape. Eventually the gall-bladder becomes shrunken and atrophic after drainage, and is usually more or less shut in by adhesions. Sometimes there is recurrence of the cholecystitis and subsequent disturbances, probably caused by inflammatory adhesions. Kehr gives the proportion of such relapses as 17 per cent. Very exceptionally a stone may re-form in such a gall-bladder, more particularly if a nucleus is provided by a foreign body such as a silk suture.

The operation may be performed in one or two stages, the gall-bladder may or may not be fastened to the abdominal wall. The usual routine operation is in one stage, with fixation of the gall-bladder to the abdominal wall. The two-stage operation, especially when the gall-bladder can be brought into the abdominal wound, is practically abandoned to-day. It formerly was performed as a prophylactic measure against the contamination of the peritoneum. To-day we no longer employ it, for four reasons. Bile as ordinarily found in the gall-bladder is not very virulent in character; the situation of the gall-bladder in the upper right quadrant of the abdomen offers little chances for generalized infection of the peritoneum. By our modern refinements of technique we can perfectly protect the surrounding parts, and it is highly important to open the gall-bladder for more thorough exploration when accessible during an operation (impaction of stone in the neck of the gall-bladder).

Cholecystotomy in one stage, with fixation to the abdominal wall. All the operative field except the fundus of the gall-bladder is thoroughly protected with pads of sterilized gauze. Two fixation sutures about half an inch apart are placed at that point of the fundus which will best project into the wound. If the gall-bladder is well distended a needle or trocar is introduced between the sutures and the contents removed by aspiration. The gall-bladder is opened at that point sufficiently to introduce the finger or instruments. Stones are evacuated by the finger or suitable scoops and spoons. One may attempt to probe (best with flexible instruments) the cystic duct, but will generally fail owing to bends or diverticula, although the duct may be

perfectly patent to bile. Injection of water to test the patency of the ducts has been suggested, but its performance is not always feasible.

DRAINAGE AND FIXATION OF THE GALL-BLADDER. A fairly stiff-walled tube, about the calibre of a 20 French catheter, is introduced into the opening, the edges of the gall-bladder incision are closed by a suture, preferably reliable chromicized catgut, so that the tube fits snugly in the opening. A purse-string suture passing through the outer coats is applied below the incision, and before it is tied the original opening and tube are invaginated into the gall-bladder and the purse-string drawn taut around the tube above. The ends of the sutures are passed through and tied to the musculo-aponeurotic layer of the abdominal wall, reinforced, if necessary, by one or two more sutures. (This is practically the technique of Kader's gastrostomy.)

The abdominal wound is sutured appropriately, and the drainage of the gall-bladder may be perfected by a siphon apparatus connected with the tube, and the dressing kept free from contamination. The tube is allowed to remain undisturbed until its removal is indicated (sterilization of the contents of the gall-bladder, reappearance of the bile in the stools). Upon its withdrawal the walls of the fistula at once tend to fall together, and the permanent closure is generally only a matter of a few days.

When the gall-bladder is so small or so situated that it cannot be approximated to the abdominal wall, drainage can still be effected by invagination as just described, and protection to the surrounding parts supplied by the introduction of gauze packing around the tube.

Cholecystotomy in two stages: (*a*) The gall-bladder is fixed to the musculo-aponeurotic layer by sutures, but not opened for several days, or until adhesions have formed protecting the peritoneum; (*b*) in cases of small or inaccessible gall-bladder the wound is liberally packed and the gall-bladder is opened several days later.

Ideal Cholecystotomy (*Cholecystendyse*). It consists in opening the gall-bladder, evacuating its contents and closing it by suture without drainage.

It is a worthless and frequently dangerous operation. It is contrary to the treatment on the basis of pathological findings in that it only removes the product and does not attack the cause of the disease.

Cholecystectomy. The removal of the gall-bladder has recently grown in favor among the surgeons with a large experience in biliary surgery. I have always been in favor of it, and find increasing indications for its performance. It enters closely in competition with cholecystotomy, and the decision to resort to it will often be determined by the existence or absence of technical difficulties attending its performance, that is, to remove it if one can do so easily and safely, otherwise simply drain.

My position with regard to cholecystectomy for cholelithiasis is expressed as follows:[1]

1. In a properly selected case it is an extremely simple and safe operation.

2. It is a *curative* operation, doing away with subsequent attacks of cholecystitis and more remotely of renewed stone formation.

3. It eliminates the disagreeable possibilities of long-continued biliary and mucous fistulæ.

4. In certain technical conditions, such as atrophic or inaccessible bladder, obliteration of the cystic duct or impacted stone in the cystic duct, and in hemorrhagic conditions of the gall-bladder, it becomes logically the method of choice.

5. It is a prophylactic measure against the development of carcinoma on the site of long-standing irritation.

6. It offers the prospect of a shorter and easier wound-healing and convalescence.

7. It is not to be employed indiscriminately, but has its proper limitations and contraindications.

Cholecystectomy may also be employed for the carcinomatous gall-bladder. It may be necessary as a secondary operation to do away with fistulæ left after previous drainage.

Ordinarily the removal of the pathological gall-bladder is quite easy, especially if distended, as its hepatic surface is free from peritoneum and can be readily peeled away from the liver. It has a great value as a curative operation, and tends to do away with the painful attacks sometimes seen after cholecystitis with the formation of adhesions provocative of painful sensations. If one has difficulty in investigating the condition of the common duct, especially when jaundice is or has been present, one should be content with cholecystotomy; also, if the gall-bladder is so buried in adhesions or presents other conditions which offer technical difficulties to its safe and speedy performance.

The operation is best performed without evacuation of the contents of the gall-bladder. One seeks either by blunt dissection or by a few snips of the scissors to enter the line of cleavage of the cellular tissue lying between the gall-bladder and the liver, and then the viscus is dissected off down to the neck, which should be brought clearly into view.

If there is no stone in the cystic duct the upper portion of this is surrounded (or transfixed) with a ligature (preferably silk) and the gall-bladder cut away just above the ligature. The cut edges of the peritoneal coat are brought in contact over the stump, securely closing it.

[1] See article by the author in the New York Medical Journal, November 30, 1901.

If a stone is present in the cystic duct and cannot be expressed into the gall-bladder the operative field is well protected, the cystic duct held in place with fixation sutures, the duct incised between them, and the stone expressed. The duct is then closed as above, or, if necessary, the duct can be drained.

The wound should always have a temporary drain for safety (gauze and tube) down to the stump. It may be gradually diminished in size, and may ordinarily be removed in a week or ten days.

The operation may be combined with other steps, such as choledocholithotomy; but in all such cases one must redouble one's assurance concerning the restoration of patency of the common duct; and when in doubt, resorting in preference to cholecystotomy.

Removal of the mucous membrane of the gall-bladder as a substitute for total cholecystectomy (Mayo's operation). This operation would seem to have at times very definite advantages, but as the writer is not familiar with it, he will quote Dr. W. J. Mayo, who kindly informs him "that it was first done in 1898, and his cases amount to fifteen, and that the operation has been done over one hundred times to his knowledge. The operation has been modified in cases in which the mucous membrane would not separate easily by removing the free portion of the gall-bladder and enucleating the mucous membrane from the deeper part. It is always loose in the neighborhood of the cystic duct. . . . . The indication in these cases is clear;[1] it is the continuous secretion from the mucous membrane, prevented by the obstruction from draining through the natural channel, which causes the trouble, the peritoneal and muscular coats are harmless, and by removing the mucous membrane down to the obstruction relief is afforded. . . . . It is as a secondary operation that removal of the mucous membrane is most serviceable. Drainage has failed to cure, and the adhesions formed by the previous union of gall-bladder to the external incison vastly increases the difficulty of complete extirpation."

Cysticotomy. Incision into the cystic duct is practically limited to the relief of stones that cannot be pushed up into the gall-bladder and it is inadvisable to amputate the gall-bladder, or when the common duct is not opened. Great care must be exercised not to wound any overlying or contiguous structures, as the cystic artery or portal vein. A couple of traction sutures passed on either side of the proposed incision will simplify subsequent measures. The incision is made directly over the stone. The subsequent treatment of the duct depends on several conditions. If we are to drain the gall-bladder or the common duct at the same time it is probably better to suture the duct in two layers—

[1] Journal of the American Medical Association, December 1, 1900.

mucous membrane and outer coat. If neither of these operations is done, it will be better to drain the duct, especially if there is any considerable catarrh of its mucous membrane. It is drained in the same manner as the common duct.

Operations on the Common Duct. These may consist in choledocho-lithotrity—crushing the stone by the fingers or padded forceps; choledochotomy—opening of the common duct, supplemented by suture or drainage of the duct; choledocho-duodenostomy—incision of the outlet of the common duct through an opening in the duodenum, or choledocho-enterostomy—the making of an artificial fistula between the duct and intestine.

In all operations on the common duct it is extremely important to have a clear operative field with a free view, for these operations may be, and usually are, very difficult. It is occasionally difficult and sometimes impossible to demonstrate the position and course of the common duct. Theoretically it would seem quite simple to open the gall-bladder and pass a guiding instrument through the cystic into the common duct. Actually it is practically impossible, and I have only once seen this attempt succeed. The common duct is concealed under the liver, and is partly crossed and hidden by the duodenum, and can with difficulty be seen, especially if any adhesions exist. Palpation of an object lying within the duct is often the first or only clue to the latter's exact location. The duct overlies the foramen of Winslow, and by hooking a finger into this we can raise and thereby better identify the duct. One traces also by direct sight or palpation the passage of the neck of the gall-bladder into the cystic duct, and from these two points one can generally recognize the upper end of the duct. Below it is sought along the upper outer border of the second or retroperitoneal portion of the duodenum. Frequently one has to depend simply on palpation of the calculus within the duct, and this procedure is likely to give rise to deception, even to the most skilled.

In addition to exposure and palpation of the duct we should in all cases endeavor to demonstrate any extraneous source of obstruction of the duct, as the presence of gallstones may be a minor source of obstruction. The pancreas should be carefully examined for tumors or other morbid conditions, and also the second part of the duodenum, which may be the seat of a tumor affecting the duodenal papilla. I now endeavor, before opening the common duct for removal of a stone, to introduce a short-curved trocar below the stone, and inject water or air through into the duodenum.

Choledocho-lithotrity. This operation will seldom be done as a matter of choice. After one has gotten so far in a difficult and dangerous operation it seems unjustifiable to jeopardize its results by allowing the

stone to remain in the common duct, although it may apparently be reduced to a condition, allowing it to be evacuated piecemeal into the intestine. Moreover, the possibility of doing serious damage to the duct is not inconsiderable.

Choledochotomy. The common duct is almost always opened for the purpose of removing stones. It may also exceptionally be opened for drainage in profound cholangitis or for the purpose of exploring the permeability of the orifice of the duct.

As one generally has to perform it, it ranks as a severe operation, with a mortality which is high even in the hands of experienced operators. The gravity of the operation depends primarily on the patient's condition, which is usually that of a severe jaundice with its attendant dangers, chiefly hemorrhage. Then the operation is more prolonged, the operative field is deeply situated, and considerable preliminary work in separating adhesions may be called for.

The operative field being well protected by gauze, two traction sutures are passed over the site of the stone when possible, and the duct opened over the stone; it may have to be seized by forceps of various patterns—bullet, alligator-jawed, angular, etc., or extracted with scoops of appropriate shapes and curves. One then passes a probing instrument in either direction for the detection of stones that may have been missed by palpation, my favorite being a metal urethral *bougie à boule.* One can only rarely pass such a probe directly into the duodenum.

The after-treatment of the duct by drainage or by suture is an open question. I think the tendency is more and more to drain, it being now realized that the incision will readily close if the pathway to the duodenum is clear. If it is not free and the duct is sutured, the suture will in all probability leak. It is, moreover, an advantage to give the inflamed duct the benefit of a period of drainage. Drainage is best accomplished by a glass tube passed down to the common duct; within it is a rather small rubber tube which is inserted directly into the duct, and packing of gauze all around these tubes to the surface. The glass tube is removed, if all goes well, in about four days. The gauze is gradually removed in about eight days, being only superficially renewed. The rubber tube stays in place till bile reappears in the stools or the external fistula is well established. Suture of the duct should, if feasible, be in two layers. Small "hammers" of Dr. Halsted's may be introduced into the duct to facilitate suture much as a ball used in darning stockings. A safety valve of gauze packing should always be employed.

Choledocho-duodenostomy. This operation, first employed by Dr. Charles McBurney, completed the chain of essential operations on the biliary tract and opened up the otherwise inaccessible retroduodenal

portion and the duodenal papilla, in which calculi frequently get lodged.

The indication for this operation is generally furnished by the recognition of the stone through the overlying duodenum (second or retroperitoneal portion), which is opened between fixation sutures, and the duct exposed, the stone being then easily grasped. Exceptionally, it may be necessary to slit up the duodenal aspect of the papilla to gain access to the stone lying just beyond the papilla. The duodenum is sutured in the usual manner. As has been stated before, a tumor of the papilla may be similarly approached. The results of this operation have been very good.

Choledocho-enterostomy. In exceptional instances it may seem wise to establish an artificial communication between the common duct and intestine. (*a*) When the common duct is permanently obstructed, and one has already made an incision into it, which, under these circumstances, will probably never close, and (*b*) when it is necessary to establish a new exit to the bile, the orifice of the common duct being permanently blocked, and it is impossible from the alteration of the gall-bladder to use it for this purpose, or (*c*) when the gall-bladder has already been removed.

The technical difficulties of the operation are infinitely lessened by the use of the smaller Murphy buttons, which are almost universally used to-day for anastomoses of the biliary tract. The duodenum is generally selected for this purpose; personally, I think it a mistake, as on account of its fixed position there may be an undesirable traction on the anastomosis, and so I always choose the jejunum in performing cholecystenterostomy, and can see no contraindication to its use.

Cholecystenterostomy. This operation is indicated for the relief of *permanent* obstructions to the outflow of bile. In tumors of the head of the pancreas it will markedly relieve the cholæmia, and, as these tumors are not very rapid in their growth, may considerably prolong life. It also relieves the cholæmia due to obstruction from chronic pancreatitis, and apparently influences that process for the better. It may very rarely be employed when it is impossible to dislodge a stone in the common duct which cannot be dealt with in any of the ways just described.

As a single step *per se* the operation is simple and devoid of great risk, excepting when performed on very jaundiced patients or as a sequel to a prolonged exploratory operation, in which case it may attain the mortality of 85 per cent., which one observer has attributed to it.

It may be performed by sutures on the general principle of intestinal anastomosis, or, what is far better and generally employed, the smaller

Murphy button, which in this work accomplishes its best function. The button is introduced into the freest portion or apex of the bladder. The other half I prefer to put into the jejunum rather than the duodenum, for reasons already stated. The button may rarely drop back into the gall-bladder, but will do no harm, or the flanged (intestinal portion) button of Weir may be used. I think one might also throw a second purse-string suture around the portion of the gall-bladder just below the insertion of the button and produce an artificial constriction just sufficient to prevent the button from falling back.

The Prognosis of Biliary Operations. The prognosis depends mainly on the site and severity of the process.

Non-suppurative and uncomplicated lesions of the gall-bladder, such as can be treated by cholecystotomy or an easy cholecystectomy, should have no more mortality than the inherent "accidental" risk of abdominal operations, say 2 per cent.

Operations on the ducts, especially the common duct in a jaundiced patient, are vastly more dangerous, and few operators can consistently show a mortality less than 20 per cent. under these graver conditions.

Complex operations and the establishment of artificial communications with the intestine have an increased mortality.

Fistulæ should not ordinarily result, and generally indicate that a more thorough operation should have been or must be undertaken.

Improvement in our results must be in the direction of earlier intervention, not necessitating operations other than on the gall-bladder. The medical profession, and to some extent the laity, must learn that cholelithiasis, while often insignificant in its consequences, is not necessarily so, and that its unfavorable sequelæ are of a most dangerous type and require severe and dangerous measures for their relief. The lesson finally learned in appendicitis will probably yet be applied to the gall-bladder, and mild prophylactic operations will do away with the necessity of many of the formidable procedures. As it stands now in New York, I think that most of my colleagues would indorse me in saying that the majority of the cases seen by them requiring operation are of the grave type which could or should have earlier been given the benefit of surgical relief.

REVIEWS.

A TEXT-BOOK OF PHARMACOLOGY. By TORALD SOLLMANN, M.D., Assistant Professor of Pharmacology and Materia Medica in the Medical Department of Western Reserve University, Cleveland, Ohio. Pp. xv., 894. Illustrated. Philadelphia and London: W. B. Saunders & Co., 1901.

A new book upon an important subject, no matter how numerous may be its contemporaries, always excites interest, for even if its contents do not present any startling addition to the sum of our knowledge, the form and manner of presentation are likely to be novel. For it is in arrangement that the teacher will find his objection to existing text-books, and thus feel the need of something different to make his instruction of the highest value. The author is by no means unknown, for before this we have read and commended his pamphlet entitled *Practical Exercises in Pharmacology*, which is contained in the work under consideration. At that time it seemed to us that aside from measuring what the student might acquire as a foundation for other usefulness the system advocated by the author must result in his being impressed by the fact that drugs are potent for good or evil, and as his judgment becomes more accurate by reason of daily practice, he must cease to regard drugs either as of no importance in the treatment of disease or as of indifferent choice. In other words, a laboratory course as here outlined would diminish in numbers or exterminate altogether that obstacle to therapeutic progress, the breed of therapeutic nihilists.

The author employs the classification of Buchheim (who becomes Buccheim at the bottom of the same page—150), which aims to unite similar drugs into groups on somewhat the same principle as is used in the natural classificati on of botany. This, as the author remarks, has the advantage that one may begin the study at almost any point; but we would suggest that the point of beginning might be determined on the principles of evolution. The grouping is generally practical for the purposes of the student, although at times peculiar, as, for instance, Chapter XXIII. contains the Ergot Group, Sapotoxin Group, and summarizes the Treatment of Cough. The excellence of the book consists in its bringing the laboratory in closer touch with the clinic, and furnishing a more secure foundation for the work of the physician. That it will succeed better than some other text-books in impressing a working knowledge of therapeutics upon the student depends more largely upon the skill and knowledge of the teacher; the student needs the aid of an experienced practitioner to get the best from it. That it contains a vast amount of material no one can deny; the question is—is this material presented in the most assimilable form? If the student has mastered this book he will know decidedly more of botany, toxicological analyses, pharmaceutical processes, and assaying and physics than the average

text-book will give him. As for the remedies at hand for use, he will not find so great a number, but it is hoped that those of which he has learned will be more thoroughly mastered. The book is marred by various departures from pharmacopœial nomenclature. At times there are instances of careless writing. Some important remedies, as erythrol tetranitrate and quinine carbamide, very properly require presentation. We are very decidedly of the opinion that thirty grains of urotropin after meals is by no means a usual amount. We are sure that practitioners and *advanced* students will find this book an admirable guide. We believe that the student entering upon the study of pharmacology will depend less upon this and more and more upon his teacher; but the practitioner can, with its aid, generalize with more certainty. As for the druggist, let him purchase the *Pharmacopœia*, which most of them do not possess, and use his *National Formulary* and his *Dispensatory* for reference. We can readily believe that "everyone interested in the use of medicines," unless he had enjoyed especial advantages in the way of biological training, would find this book a source of confusion. For the junior student under an excellent teacher, for the advanced student, for the progressive practitioner, we regard the work as especially well adapted, and we congratulate the author upon the success with which he has gathered together an imposing array of facts and the skill with which he has interwoven them. R. W. W.

SURGICAL TECHNIC. A TEXT-BOOK ON OPERATIVE SURGERY. By FR. VON ESMARCH, Professor of Surgery at the University of Kiel, and Surgeon-General of the German Army, and E. KOWALZIG, late Assistant at the University of Kiel. Translated by PROFESSOR LUDWIG H. GRAU, Ph.D., and WM. M. SULLIVAN, M.D. Edited by NICHOLAS SENN, M.D. Pp. 866, with 1497 illustrations and 15 colored plates. New York: The MacMillan Company, 1901.

THIS most admirable work is the outcome of a prize offered by the German Empress, on the occasion of the Vienna Exposition, for the best hand-book on surgical technic. Out of a number of works submitted in competition, the jury, consisting of Langenbeck, Billroth, and Socin, unanimously awarded the first prize to the work now under review. Since that time it has undergone five German editions, the last of which is in three small volumes. The principal author, von Esmarch, later associated himself with Kowalzig, and the work in its present form is the result of their combined efforts. It has been before the public in the original German for a number of years, but has very recently appeared in one volume, in English, under the able editorship of Dr. Senn.

It is essentially a work on surgical mechanics or surgical technics, and deals not at all with pathology, but simply with the question of how to treat various surgical conditions. So far as the order of its contents is concerned, the subject first considered is the treatment of wounds, followed by bandaging and narcosis. Infiltration anæsthesia is given due consideration, as well as the cocainization of the spinal cord. Then follows mention of those simple operations which are usually included under the term of "minor surgery," including the removal of foreign

bodies and bullets, for whose localization various methods are devised, including the electric or telephone probe. Prevention and arrest of hemorrhage are fully considered, and the ligation of arteries at points of selection is admirably illustrated. Ten colored plates are given up to showing the surgical anatomy of the large vessels and illustrating operations upon them. Then come operations upon aneurisms and varices, the more radical operations, as by obliteration, excision, etc., of veins receiving a fair and favorable consideration. Operations on tendons and on nerves are rather briefly but perhaps sufficiently illustrated, since indications are not considered, but simply the technical part of operations themselves. Skin grafting is well described, but the various plastic operations for covering skin defects are too briefly considered. Operations on bones are summarized in fifteen pages, but the directions are explicit and sufficient for most purposes. To the subject of amputations and disarticulations seventy pages are given up, in which are mentioned about all of the amputations which are of any value or which can be deliberately planned out. Colored plates in this section illustrate also the topographical anatomy of limbs at points of election for amputation. Osteoplastic methods in various parts of the body are amply treated. To the subject of resections some sixty-five pages are devoted, and here again there is little left out that one would desire to see inserted. Operations on the head are made to include all the operations on the face, as well as upon the nerves, the accessory sinuses, the mastoid, etc. The special plastic surgery of each region is given by itself. Removal of nasal and nasopharyngeal polypi is admirably summarized. So also are operations upon the pharynx. And so one might go on through the entire body, to which the balance of the work is devoted, and find that each region has its operative surgery succinctly and admirably summarized. Thus, for instance, all the operations which one practices upon the gall-bladder, as well as the operation for echinococcus of the liver, are tersely but sufficiently described.

The two prominent and distinctive features of the book are the terseness of the descriptions, no superfluous words being used, though at the same time they are almost invariably ample; in addition to this, the wealth and illustrative value of the illustrations—as there are nearly twice as many figures as there are pages in the work, some idea can be gathered from this of the richness of this pictorial aid to verbal description. The translator has done his work well and has admirably imitated the terseness of the original. The task of the editor seems to have been very light, since there was very little which he or anyone else could add to the original text of Esmarch and Kowalzig. The book is an extremely valuable one, and the English-speaking public are certainly under many obligations to the publishers for presenting it in this most useful and admirable form. R. P

ELECTRICITY IN MEDICINE AND SURGERY. By WILLIAM HARVEY KING, M.D. Pp. 504. New York: Boerick & Kenyon Co., 1901.

IN view of the fact that at the present time the profession is almost overburdened with works upon the subject of electricity it has been fondly hoped by those interested in the study of electro-therapeutics that

the day of unscientific publications had passed. Aside from a brief and rather disjointed description of electro-physiology, by W. Y. Cowl, M.D., of Berlin, this book has little to commend it as a valuable adjunct to scientific electro-therapeutical literature. The entire work may be summed up as inadequate for the specialist, too vague and uncertain to the general practitioner, and of very little practical value to the student. T. B. E.

HUMAN PHYSIOLOGY. PREPARED WITH SPECIAL REFERENCE TO STUDENTS OF MEDICINE. By JOSEPH HOWARD RAYMOND, A.M., M.D., Professor of Physiology and Hygiene in the Long Island College Hospital, and Director of Physiology in Hoagland Laboratory, New York City. Second edition, entirely rewritten and greatly enlarged. Handsome octavo volume of 668 pages, 443 illustrations, 12 of them in colors, and 4 full-page lithographic plates. Philadelphia and London: W. B. Saunders & Co., 1901.

IT seems hardly commendable in a text-book of elementary physiology to predicate *ex cathedra* on questions that are still subjects of controversy (the alcohol question, the physiological effects of removal of the stomach in man, the interpretation of laryngeal photography, the status of the uric-acid question etc.); the author, moreover, does not lend the weight of his personal authority to many of the statements made, but contents himself with quoting from other authors who, in their turn, are in some cases merely reviewing the publications of foreign investigators. Nearly four pages, for instance, are given to a paragraph on the sources of uric acid, consisting exclusively of a quotation from Chittenden (*Brooklyn Medical Journal*); in the preface these pages are claimed to be "the most recent contribution of Chittenden to the genesis of uric acid," whereas, in reality, they are a well-written review (by Chittenden) of the "most recent contributions" of some fifteen or twenty other investigators. Of some seventeen pages on Voice nearly fifteen are either in quotation marks or are prefaced by "from articles in this publication (*New York Medical Journal*) we quote freely," referring to the work of "Professor Thomas R. French, of the Long Island College Hospital." The pages on the coagulation of the blood are very good, but again they are quoted; thus, the paragraph on fibrinogen is from a paper by Matthews, and the author announces that there is no better way of presenting the status of the question than by "giving the views of Schaeffer;" this he does over some six or seven pages. The chapter on removal of the human stomach, it appears to us, is too long and out of all proportion to the length of other more important chapters; a brief sketch report of the cases of Schlatter and Brigham, instead of such extensive quotations from these authors, would have been sufficient. And we fail to see what advantage can accrue to a student of elementary physiology from looking at a half-page photograph of an old woman whose stomach has been removed, or a large cut of a Murphy button.

The arrangement of the topics is very practical, and there is such a formidable array of facts and figures that aside from serving as a text-book for students under the guidance, of course, of a teacher and a

laboratory demonstrator, the book promises to be useful as a ready reference hand-book for practitioners and advanced workers. There are a few inaccuracies in the text, and here and there a contradiction: on page 98 the statement is made that "up to the present time no dextrose-producing enzyme has been obtained from the liver," whereas on page 250 we read "a ferment has been obtained from the liver which does convert glycogen into dextrose." If the author chooses to consider the sulphuretted hydrogen in the intestine as a "physiologic ingredient" of the body, if he considers cholesterin or lecithin to be a "constituent of protoplasm," or if he states that "the difference between organized and unorganized ferments is a superficial one," and defines diabetes mellitus as "an affection characterized by an immoderate and abundant flow of urine," we can readily overlook these and some other little lapses in view of the really painstaking treatment that he has given the general subject of physiological chemistry; the author realizes the fundamental importance of this auxiliary subject and appreciates that, "as a rule, medical students have an insufficient knowledge of this branch;" the chemical portions of the book we consider exceptionally good for a text-book of this character, and many an older practitioner, and, we fear, many a younger one, who is a recent "graduate" in this subject—*sit venia verbo*—will find a perusal of these portions of the volume most profitable.

The histological parts of the work are very clear and comprehensive, the neuron theory is well introduced, and the chapter on the reproductive functions, particularly the paragraphs on menstruation and ovulation, are well written and modern; the chapter on the special senses is particularly good. A. C. C.

AN INTRODUCTION TO THE BACTERIOLOGICAL EXAMINATION OF WATER. By W. H. HORROCKS, M.B., B.Sc. Pp. 300. London: J. & A. Churchill.

IN order to determine whether a water is likely to injure the health of those drinking it, one must, as the author says, necessarily have clear ideas as to the hygienic importance of the various micro-organisms which it may contain. The bacteria which may be found in water he divides into three classes:

I. Those found in pure water.
II. Those common to sewage and rarely met with in pure water.
III. Those which give rise to specific diseases in human beings.

Within the 300 pages which make up this volume the organisms which are included in these three groups are treated in detail.

Chapter I. contains a concise and most satisfactory exposition of the limitations of chemical and bacteriological examination of water, and of the exceptional difficulties which attend qualitative bacteriological work. Chapters II. to V. are devoted to the quantitative bacteriological analysis of water, and deal with the preparation of blood cultures, the multiplication of micro-organisms in water, the influence of light, movement, rest, electricity, sedimentation, and chemical composition of water on the same, their duration of life, the bacterial contents of snow, hail, rain, rivers, lakes, wells, and springs, and the relation of quantitative

bacteriological analysis to filtration of water through sand. Chapters VI. to XIV. deal with qualitative work. The author notes that the isolation of the typhoid fever bacillus can be accomplished only under exceptionally favorable circumstances, and that, this being the case, it is highly desirable, in the absence of the discovery of the specific bacterium, to be able to state that the suspected water has been polluted with sewage. Hence the division by him into classes, as above. Bacteria of the first class are arranged into groups of certain well-defined types, and these again subdivided, according to peculiarities of growth. Each species is then thoroughly described; its microscopical appearance, its behavior on the various culture media, motility, spore formation, etc. Then those of Class II. are considered. Of the bacteria in this class, B. coli communis is the most important. The culture characteristics, morphology and serum reactions of the typical bacillus are first considered, and then the more important varieties are compared with the type. The value of B. coli as a sign of sewage contamination is then discussed. The chief arguments against the acceptance of this organism as a certain indication of sewage contamination (*e. g.*, the statement that the organism exists abundantly in all waters and soils) are stated and answered in a spirit of great fairness. Of the organisms falling under Class III. only those of cholera and typhoid fever are considered, since these diseases are really the only ones known to be water-borne. The characteristics of the typhoid organism and the most important of the various tests are described and considered in order, with a very full exposition of the reactions of anti typhoid serum and general conclusions thereon. In but very few examinations has the typhoid organism ever been isolated, if we exclude the early announcements of its discovery, and these should be excluded, or, at least, accepted with very great reserve, since most of the tests deemed essential at present were not applied. The characteristics of the cholera organism also are given, with methods for its isolation from water. Chapter XV. is devoted to the action and comparative value of the Pasteur and Berkefeld filters, and Chapter XVI. is a summary of the procedures recommended for the bacteriological examination of water and preparation of nutrient media. In addition, a full bibliography of the subject is given.

The work is necessarily of a technical nature, but is, nevertheless, very readable, even to one who is not a bacteriologist. It is worthy of the highest praise, and should prove useful to every sanitarian. C. H.

INTERNATIONAL CLINICS. Edited by HENRY W. CATTELL., A.M., M.D., Philadelphia, with Collaborators. Vol. I. Twelfth series. Pp. viii., 306. Philadelphia: J. B. Lippincott Company, 1902.

THE twelfth series of this publication comes to us for criticism presenting but little to invite it. Its contents are various and important; Meigs, on the use of opium in daily practice, while presenting a plea for its employment under special indications, at the same time points out the fact that no argument is required for its present needless employment. Wood, Jr., continues his interesting series of papers on the methods of investigating the action of drugs, more or less elementary, it is true, but at the same time instructive to those not conversant with

modern laboratory methods. Two articles—on the significance of basophilic granules in red corpuscles, with special reference to their occurrence in chronic lead-poisoning, by Simon, and on gastro-intestinal auto-intoxication, by Hemmeter—are of great value to the thoughtful physician. Both are exhaustive and scholarly, as their writers from their past productions have led us to expect. In surgery, Marnoch, Greig, Holmes, Rodman, Griffith, Young, and Kelly present a most miscellaneous collection of notes on topics from coxa vara to the surgical treatment of infantile palsy. He, indeed, must be difficult to please who can find nothing to interest him. In obstetrics, Bustard discusses the contest between the advocates of symphysiotomy and the partisans of Cæsarean section, and Randall presents a brief paper on a deposit of chalk in the tympanic membrane, and a case of mastoid disease due to smallpox. The remaining papers are well chosen and presented

The volume ends with a review of the progress of medicine during the year 1901, by Watson, who divides his subject somewhat peculiarly under the following topics: medicine, neurology, toxicology, therapeutics, new remedies, surgery, obstetrics and gynecology, pathology, new instruments and devices, the eightieth birthday of Rudolph Virchow and the death of President McKinley. As we have said in noting this feature of the series, this section is entirely unsatisfactory, not because the work is not well done, for it is so far as the author has gone, but because the year-books so thoroughly cover the field, and a review limited by space considerations fails to be either competent or comprehensive, no matter how brilliant and painstaking the author may be. In this volume appear biographical sketches of two physicians, accompanied by illustrations supposedly pertinent to the subject. While no one may question the eminence of the individuals chosen, the utility—to the reader—of this innovation is not apparent. The physician who is conversant with medical literature knows their work and attainments; he who reads none is not likely to find them in this volume. It is no compliment to the individual, whose rank is of the highest, to appear as the subject of a sketch which the daily press might readily produce. The entire volume is well and satisfactorily illustrated. The frontispiece alone is open to objection, in that it apparently gives the sanction of high authority to a practise which we had believed obsolete—that is, sitting astride the patient—a practise as undignified as it is unnecessary.

R. W. W.

BIONOMICS: EXPERIMENTAL INVESTIGATIONS WITH BACILLUS SANARELLI AND EXPERIMENTAL INVESTIGATIONS WITH MALARIA, IN CONNECTION WITH THE MOSQUITOES OF NEW ORLEANS. By PROFESSOR GEORGE E. BEYER and DRS. O. L. POTHIER, M. COURET, and I. I. LEMANN. New Orleans, January, 1902.

THIS very interesting report is divided into three parts. Part I. deals with the mosquitoes of the city of New Orleans and vicinity, their seasonal and topographical distribution, and other important data. It appears that of the nine genera of mosquitoes thus far recognized in the United States, no less than seven are represented in Louisiana, and six by no less than fourteen species within the limits of New Orleans. Most of these fourteen species have been thoroughly studied and are well

described. By far the commonest of all is *Culex pungens*, which is common all the year round. Forty-five per cent. of the more than 200 cisterns and other collections of water were found to contain their larvæ, which were found also even in the river in many places.

In but 2 of 210 cisterns, barrels, troughs, and other vessels containing water were no mosquito larvæ found. Those of *Stegomyia* (yellow-fever mosquito) were most numerous, being found in over 60 per cent. Considerable space is devoted to a consideration of *Stegomyia fasciata* and of the three species of *Anopheles*. As a whole, Part I. is exceedingly interesting and useful.

Part II. deals with experiments with Sanarelli's *Bacillus icteroides*. In these experiments two modes of infection were employed: 1, direct inoculation; 2, mosquito inoculation. The work was done with cultures obtained during the epidemic of 1898, from the blood of 20 cases of yellow fever on the second and third days of the disease. Animals were inoculated with these cultures, and then mosquitoes were allowed to bite them. Many experiments were performed, but their results are by no means convincing. It is true that after inoculation the animals commonly died, and showed evidence of great congestion and of degenerative changes. But this does not mean that they had yellow fever. It is true, also, that mosquitoes, after sucking the blood of the sick animals, appear to have become infected, and on biting fresh animals conveyed the infection. But, again, we have no evidence that the disease so conveyed was yellow fever. In fact, in view of the work of the United States Army surgeons in Cuba, we have every reason to believe that the disease was not yellow fever.

Part III. deals with malaria. The malarial parasites and the two different cycles necessary for their development are described; but nothing essentially new is given. From the evidence at hand the authors believe that the pernicious æstivo-autumnal type of malaria is disseminated by *Anopheles crucians*, for this form of the disease is unknown where this species is absent, and the distribution of the two corresponds very closely. The authors make recommendations for ridding the city of mosquito-breeding places, for preventing the insects from breeding in cisterns and other collections of water, and for screening malaria and yellow fever patients, so as to prevent access, and consequent infection, of the specific mosquitoes. So, whether or not their experiments have any scientific value, their recommendations coincide with those based on the work of Reed and Carroll, the value of which is unquestioned, and thus the same end will be attained. The report closes with a very valuable and complete bibliography of malaria and mosquitoes and yellow fever and mosquitoes. The value of the report is increased, also, by a number of very good illustrations of different species of mosquitoes, their eggs and larvæ. C. H.

THE PATHOLOGY AND TREATMENT OF SEXUAL IMPOTENCE. By VICTOR G. VECKI, M.D. Third edition, revised and enlarged. 12mo., 329 pages. Philadelphia and London: W. B. Saunders & Co., 1901.

IT has long been a source of surprise to the reviewer to note not only how little attention was paid to this subject by teachers in medical schools, but also the apparent reluctance of most medical authorities to

deal with this most highly important question with any degree of seriousness and in a scientific manner. That this condition of affairs is not due to want of interest on the part of the profession at large is shown by the fact that the present work has passed through two editions in two years, the present one being the third.

It seems to us to be a sorry commentary on the scientific spirit which the medical man is supposed to possess, to read in the author's introduction that to "write on the much-scouted subject of sexual impotence is a venturesome undertaking under all circumstances," and again, "Many an eminent medical man may have felt a secret desire to take the risk, but refrained through fear of endangering his professional reputation."

That these statements accurately represent the prevailing sentiment among medical authors and teachers at the present day is demonstrated by the scarcity of literature on the subject, and the almost complete absence of general clinics both in this country and, according to Vecki, in Germany, also, upon this disease. The result of all this is that a large majority of unfortunate patients affected with this condition are practically left to the care of charlatans and quacks.

Vecki is to be most heartily congratulated upon possessing the moral fortitude apparently necessary upon entering this field of medical literature. The result of his efforts has been a work most admirable in every particular, dealing with the subject in a most comprehensive manner, and withal absolutely free from the slightest suspicion of having been written for the lay public.

The chapter on treatment affords reading of considerable historical interest, but which may prove from a therapeutic stand-point to be somewhat disappointing. However, in this connection it must be borne in mind that the author is dealing with a most intractable condition, one which ofttimes is never cured.

The work as a whole constitutes the most interesting and instructive book that we have seen upon this subject, and we commend it to the general profession as a sound and reliable guide to the management of this troublesome class of patients. H. M. C.

DISEASES OF WOMEN: A MANUAL OF GYNECOLOGY. By F. H. DAVENPORT, A.B., M.D., Assistant Professor of Gynecology in the Harvard Medical School. Philadelphia and New York: Lea Brothers & Co.

IN this the fourth edition of his book the author has maintained the enlargement first seen in the last edition. His first two editions dealt with the subject from the non-surgical side, but in the last two editions the attempt has been made to deal with the technique of the various operative procedures also. This attempt we believe to be a mistake, since in a volume of this size the requisite space cannot be afforded for their due consideration. Moreover, the man who desires to practise pelvic surgery will, of course, have recourse to the larger works, as well as the training which comes from years of actual assisting at the operating-table. To the general practitioner the details of operative procedure are of no value, and in our opinion their inclusion in the present volume detracts from its general excellence. On the other hand, the preparation of

cases for major surgical procedures and their after-care, with the complications likely to arise, together with their appropriate treatment, are matters of paramount importance to all men engaged in general work, since in many cases the responsibility for these details will rest upon them. The instruction contained in the book relative to these questions is, therefore, well placed.

With regard to the teaching presented by the author upon the various subjects considered, we can in most instances thoroughly agree, but there are a few points with which it is necessary to differ. One of the most important is with regard to the teaching upon the subject of the lowest type of dysmenorrhœa. We do not believe in the gradual dilatation, as advised by the author in the cases of dysmenorrhœa due to anteflexion, either as a therapeutic agent or as a means of determining whether or not a formal operation is demanded. Such teaching is certainly most dangerous when placed in the hands of the ordinary doctor, and if followed will lead to infection in many instances. Furthermore, we do not believe in the possibility of any data of value being furnished by the procedure.

Finally, one statement made while considering the question of uterine cancer is, we think, most unfortunate in that it tends to mislead the reader. Instead of saying that the diagnosis of uterine cancer is easy, as a rule, a statement at present too true, only because of the lack of care in many instances on the part of the medical man, it would certainly have been better to have emphasized the fact that the diagnosis, if it is to be made at a time sufficiently early to be of value from the curative side, is often one of the most difficult in medicine.

W. R. N.

OPHTHALMIC MYOLOGY: A SYSTEMATIC TREATISE ON THE OCULAR MUSCLES. By G. C. SAVAGE, M.D., Professor of Ophthalmology in the Medical Department of Vanderbilt University. 8vo., pp. viii., 589; with 61 illustrative cuts and 6 plates. Nashville, Tenn.: Published by the author, 1902.

THIS work offers itself as a most valuable exposition of one of the most important principles underlying the physiology, the psychology, and the therapy of the ocular muscles. In consequence, it not only appeals to the ophthalmologist, for whom it has been primarily written, but also to the advanced physiologist and psychologist.

Careful study of its contents will show that the author has expended much time and study upon the entire question. Many of the thoughts offered, theories explained, and data given are both new and novel, and hence well worth consideration.

The teachings promulgated in this volume—teachings that are situated upon the very threshold of advanced medicine, as it were—should be studied assiduously and in every detail by every thinking mind in these three branches of medical science.

C. A. O.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

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Basedow's Disease.—ALBERT KOCHER (*Mitteilungen aus den Grenzgebieten der Medicin und Chirurgie*, Bd. ix., Heft 1 und 2) has recently reported in detail the cases of Basedow's disease which have come under the observation of his father, Professor Kocher, in his hospital and private practice, between the years 1883 and 1899. The series includes 93 cases, of which 74 were cases of true exophthalmic goitre. The report, which is really a monograph covering 304 pages, is a most valuable one, owing to the carefully recorded histories and the detailed analysis of symptoms. What is of especial interest in the report is the record of Professor Kocher's results obtained from his operative treatment for the cure of exophthalmic goitre. Owing to the unsuccessful results obtained from most forms of medicinal treatment these operative procedures and their results are of great interest both to the clinician and surgeon.

Kocher insists that the operation should not be done when the patient is in the stage of marked cardiac and psychical irritability. Measures must be taken to reduce these as much as possible first. All the operations were performed with the use of local anæsthesia, a 1 per cent. solution of cocaine being used. No general anæsthetic was given. In all, 59 of the 74 cases of true Basedow's disease were operated on. The following are the operations which were performed, with the number of cases operated on by each method:

(1) Excision of one lobe of the thyroid, 14 cases. (2) Ligature of the thyroid arteries, 16 cases. (3) Excision of one lobe and ligature of the vessels to the opposite lobe, 19 cases. (4) Half-sided excision and partial resection, 4 cases. (5) Half-sided, partial resection and ligature of the arteries, 3 cases. (6) Ligature of the arteries and resection of the sympathetic, 3 cases. (7) Ligature of arteries and partial resection, 1 case.

Four of the 59 cases operated on died with symptoms of tetany within ten days after the operation. Of the remaining 55 cases, 39, or about three-fourths, had unpleasant post-operative symptoms. These consisted of transitory psychical disturbances, irritability, oppression, palpitation, sensation of heat, congestion of the face, general tremor, sweating, vomiting, fever, and irregular, frequent pulse; in fact, temporary increase in the symptoms present before the operation. The fever and tachycardia followed in all the 39 cases. The other symptoms mentioned occurred in the majority of the patients. The possibility that these symptoms are due to an acute toxæmia resulting from absorption of certain substances pressed from the gland during the operation is discussed, but a satisfactory explanation for the aggravation of the symptoms is not arrived at. The other 16 patients operated on had no disagreeable after-effects.

The results of the operative treatment are most satisfactory. Of the 59 cases operated on, 45, or 76 per cent., were cured; 8, or 14 per cent., were decidedly improved; 2, or 3.3 per cent., were only slightly improved; 4, or 6.7 per cent., died with symptoms of tetany as a result of the operation.

In 15 of the 74 true Basedow's cases medicinal treatment of various kinds was used. The results, notwithstanding the fact that several of them were mild cases, are in striking contrast to those from the operative treatment. In only one case could a cure be said to have occurred, and this was really brought about by the patient developing an intercurrent disease. The various forms of treatment adopted are given in detail, and special emphasis is laid on the injurious effects on the disease produced by treatment with iodine and potassium iodide, which are frequently administered in regions where ordinary goitre is endemic.

Out of the 93 cases there were 14 in which a diagnosis of *struma vasculosa* was made, in which the main feature was enlargement of the thyroid due to increased blood-supply to the gland, and in which the other features of exophthalmic goitre were absent. These cases are regarded as being distinct from Basedow's disease, although a few in young individuals are somewhat closely related. Nine of these cases were operated on with most satisfactory results. The operation consisted in tying one or more of the thyroid arteries.

Post-mortems were obtained in three of the four fatal operative cases. Several factors may have played a part in the cause of the fatal termination in the first case. There was a persistent thymus, the heart was dilated, and there was a fluid exudate in the serous cavities, and the superior cervical ganglion was very much enlarged. In the second case death was found to be due to double-sided pneumonia and pleurisy. Death in the third case was believed to be due to the severity of the intoxication. At autopsy the dilated heart, spleen tumor, jaundice, and fatty degeneration of the liver and spleen confirmed this view.

The Leucocytic Changes following Intravenous Injections of Cinnamate of Soda.—SHAW (*The Journal of Pathology and Bacteriology*, March, 1902, vol. viii. No. 1, p. 70) undertook a series of experiments on cats with the object of trying to obtain some additional information regarding the morphology and development of leucocytes. The method adopted in the experiments

was as follows: A count of the red cells and leucocytes and a differential count of the latter was made of the blood from the jugular and splenic veins before the drug was injected. Then an emulsion of one-quarter grain of cinnamate of soda in sterile salt solution was injected into the jugular vein. After the lapse of three or four hours a complete examination of the blood was again made, the animal in the meantime being kept under the influence of ether. As a result of the study of the blood of five cats the following conclusions are drawn:

1. Richter and Spiro's observations on the general leucocytosis produced by cinnamate of soda are confirmed.

2. The effect is *not* produced by depriving the blood of a certain amount of liquid, thereby tending to leave in the vessels relatively more corpuscles per cubic millimetre.

3. As a result of the injection of cinnamate of soda, the simpler lymphocytes are stimulated to transformation into polymorphonuclear cells and intermediate forms. The administration of ether (as shown in a control animal) has a similar effect, though it is not so complete in character.

4. So far as the spleen is concerned, such changes are not greatly more or greatly less marked in the blood of the splenic vein than in that of the jugular vein; in other words, the spleen does not appear to act as an aid or hinderance to the transformation excited by the sodium cinnamate. A series of experiments is now being carried out in which, before injection of cinnamate of soda, splenectomy is performed, with the view of still further estimating whether the spleen has any effect or not upon the leucocytosis brought about by injection of sodium cinnamate.

5. That both cinnamate of soda and ether cause a diminution in the percentage of eosinophile cells in the blood stream.

Shaw's results seem to go toward confirming Uskow's theory that the granulated leucocytes are derived originally from the lymphocytes.

Angina Cruris (Intermittent Claudication) and Allied Conditions, Including Painful Cramps, with Remarks on the Importance of Examining the Pedal Arteries.—WALTON and PAUL (*Boston Medical and Surgical Journal*, April 3, 1902, p. 351), in a very interesting paper, suggest the name *angina cruris* for the group of symptoms first described by Charcot in 1858, and usually known under the name of "intermittent claudication." They refer to the various other names that have been applied to the affection, and state that they are misleading, in that they unduly emphasize an unessential feature of the disorder (lameness), while drawing no attention to the essential symptom, namely, intense paroxysmal pain.

According to the writers, the clinical picture of well-developed angina cruris consists of more or less frequent brief attacks of intense paroxysmal pain in the leg, affecting, as a general rule, the same region, oftenest the calf, recurring at irregular intervals, generally when in the erect position, but not infrequently while the patient is in bed. The condition is usually accompanied by local asphyxia and cyanosis, and usually in a limb in which pulsation is wanting in the dorsalis pedis or the posterior tibial, or both. The attack resembles in its severity that of painful facial tic. The various causes that have been advanced to explain the group of symptoms are dis-

cussed, but the writers favor Goldflam's view that the pain is of vascular origin, conveyed, perhaps, as Goldflam suggests, from the sensory corpuscles in the vessel walls.

The comparative frequency of the condition has been recently illustrated by the fact that Higier, Goldflam, and Hagelstam have reported 18, 24, and 23 cases, respectively. These authors believed that certain races—for example the Semitic—were peculiarly subject to the complaint.

During the past few months Walton and Paul have observed one typical and fifteen other cases representing a modified type of the disease. They are evidently inclined to the view that many cases of recurring local cramps properly belong to this condition, particularly when associated with vascular changes.

The cases heretofore reported have been largely in males. Nine of the cases here reported occurred in women, however. As to the etiology of claudication, two factors appear with great frequency throughout the literature, namely, a tendency to defective circulation and a constitutional neuropathic taint. An important feature of many of the published cases has been the obliteration of the pulse in the superficial arteries of the affected extremity. It is of interest that the writers found that the blood pressure was markedly increased in the toes on the involved side during the spasms of pain.

The following conclusions are drawn:

1. The concurrence of the paroxysmal pains of angina cruris with pulseless pedal arteries is too constant to be explained by coincidence, though it is true that pulseless arteries may be found without the pains, and, conversely, that such pains may appear with apparently normal arteries.

2. The painful paroxysms are probably of vascular origin, and result from vascular spasm, coupled, perhaps, with increased blood pressure acting on vessels already partially occluded, whether from local or general disease (aneurism, syphilis), from senile changes (atheroma), or from congenital tendency to angiofibrosis.

3. Recurring painful cramps of constant seat probably represent a modified form of angina cruris.

4. It is important to examine the dorsalis pedis and posterior tibial, as well as the radial and temporal arteries, in all cases in which it is desirable to estimate the bearing of the vascular condition upon disease in the central nervous system or elsewhere.

The Leucocytosis of Scarlet Fever and its Complications.—Bowie (*The Journal of Pathology and Bacteriology*, March, 1902, vol. viii., No. 1, p. 82), as a result of the study of the leucocytes of 167 cases of scarlet fever, draws the following conclusions:

1. Practically all cases of scarlatina show leucocytosis.

2. The leucocytosis begins in the incubation period, very shortly after infection, reaches its maximum at or shortly after the height of severity of the disease, and then gradually sinks to normal.

3. In simple uncomplicated cases the maximum is reached during the first week, and the normal generally some time during the first three weeks.

4. The more severe the case, the higher the leucocytosis and the longer it

lasts; the slighter the case, the slighter the leucocytosis and the shorter time it lasts.

5. A favorable case in any one variety of the disease—*e. g.*, simple, anginose, etc.—has a higher leucocytosis than an unfavorable one of the same variety.

6. The fever—*i. e.*, temperature—has no direct effect on the leucocytosis.

7. The polymorphonuclear leucocytes are increased relatively and absolutely at first, and then fall to the normal, the lymphocytes acting inversely to this; this cycle of events occurs in simple cases within three weeks.

8. Eosinophiles are diminished at the onset of the fever. They increase rapidly in simple favorable cases until the height of the disease is past, then diminish, and finally reach the normal some time after the sum total leucocytosis has disappeared—in short, when the poison has all been eliminated.

9. The more severe the case the longer are the eosinophiles subnormal before they rise again, as described above (*vide* 8); in fatal cases they never rise, but sink rapidly toward zero and remain there.

10. The leucocytes, in complications, go through a cycle of events similar in all respects to that of the primary fever, as regards sum total and differential leucocytosis, and the same laws govern the behavior of the leucocytes in both cases.

Bowie thinks that the rather early eosinophilia and its persistence for a considerable time is of value in diagnosing the disease from tonsillitis and septic conditions, with both of which the disease is likely to be mistaken. He also believes that the course of the eosinophiles is of value from a prognostic stand-point. If they are normal or subnormal after the first day or two then the case will in all probability be a severe one. As long as a relative increase of eosinophiles is present, one cannot be sure that some complication will not ensue; where, as if the eosinophiles have come down to normal in the usual way, one should be free from anxiety in this respect.

SURGERY.

UNDER THE CHARGE OF

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The Operative Treatment of Tumors of the Superior Maxilla.—STEIN (*Archiv f. klin. Chir.*, 1902, Band lxv., Heft 2) states, in summing up the results of his experience, that operation is to be advised in every case in which the tumor is progressing. As Estlander noted in 1879, the patient who has a sarcoma of the superior maxilla has only about a year and a half from

the onset of his disease to live, and, as a rule, these cases do not present themselves for treatment until a year of this time has passed. Without operation there is no hope, while with it the average mortality is 17 per cent. (in the author's hands it has only been 12½ per cent.); there is an equal chance of being permanently cured, another just as great that life will be prolonged for a year or so, and there will usually be complete relief from pain.

The Influence of Castration (Testicular and Ovarian) upon the Development of the Skeleton.—BRIAU (*Gaz. hebdomadaire de Med. et de Chir.*, 1901, No. 65) states that for many years observers have noted the exaggerated development of the stature in those persons who at an early age were affected with atrophy or arrest of development of the ovaries or the testicles. Godard has noted the development of the skeleton in the Egyptian eunuchs, and states that those who have reached adult age are very tall and thin; a similar change has been noted as occurring in various species of animals similarly treated. With a view to confirming these results the author experimented on young animals. The animals were castrated when fifteen days old, and killed for pathological examination just six months later, when they had not yet reached their full growth. Of the first set of experiments only two male animals survived, one a eunuch and the other the test animal, while in the second set three female animals survived, one of the test animals and two eunuchs. Examination and weighing showed that the skeletons of the castrated animals were very much larger and heavier than those of the ones which had been similarly confined as a control experiment.

Two Cases of Splenectomy.—BLAUQUINQUE (*Gaz. hebdomadaire de Med. et de Chir.*, 1901, No. 99) reports two cases of splenectomy performed in the usual manner, one for the relief of an enlarged spleen of unknown cause, and the other for a leukæmic spleen. The first case was a man aged sixty-two years, whose spleen had reached enormous size. Its removal was not attended with any particular difficulty, and the patient made an uninterrupted recovery. The second case was a man, aged thirty-three years, who had a marked case of leukæmia, the blood showing one white corpuscle to each ten red cells, and the spleen was of enormous size. The spleen was easily removed, but a severe internal hemorrhage caused the patient's death eight hours after the operation. These two observations demonstrate that in splenomegalia or simple splenic hypertrophy the removal of the spleen is indicated and the operation is nearly always a success, while, on the contrary, operative interference is contraindicated in leukæmia.

Gonorrhœal Osteopathies.—PHILIPPET (*Gaz. hebdomadaire de Med. et de Chir.*, 1901, No. 79) states that the complications of gonorrhœa affecting certain joints and serous membranes are well known at the present time and are distinctly separated from true rheumatism. More rare are the osteoperiosteal complications which have often attracted the attention of clinicians. These osteopathies present two different forms: (1) The acute form, corresponding to a periostitis or to the simple inflammation of the periosteum, as described by Fournier, and to the first degree of the osteofibrous gonorrhœal rheumatism, as described by Jacquet. In some cases, as Jacquet has noted, the

periostitis is complicated by a marked degree of osteitis. (2) A chronic form, corresponding to the periostitis described by Fournier, the osteitis of Jacquet, and the hypertrophic periostitis of Hirtz.

In the acute variety of osteoperiostitis the lesion is generally found situated at one of the more prominent portions of the skeleton, as on the tibia, between the insertions of the ligamentum patellæ, the extremity of the metacarpal or metatarsal bones, etc., but it is rare to find more than one of these lesions upon the same patient; however, Fournier has reported one case which presented five separate areas of periostitis. The functional symptoms are of much greater value for diagnostic purposes than the physical signs. As a rule, the patient will complain of pain in a circumscribed portion of a bone. Careful examination will show that pressure over the affected area, which is small, and as a rule not larger than a fifty-cent piece, causes marked pain; pressure in the region around the small area is absolutely painless. When the lesion affects certain portions, as the os calcis, for example, there is an absence of pain when the patient is quiet, but on attempting to walk it becomes marked. In the form without deformity, which is a well-recognized type, the pain caused by walking or by pressure exists, either at the attachment of the tendon of Achilles to the os calcis or under the heel in the region of the calcanean tuberosity. Sometimes, but not always, there exists a certain degree of puffiness of the tissues, forming a slight protuberance in the region of the point of tenderness. More rarely the skin at this point is more or less red. As a general rule, the acute osteoperiostitis is of rapid development. It comes on at the third or fourth week of the gonorrhœa and lasts from one to two weeks. At the end of this time the phenomena of pain and swelling gradually disappears until resolution is complete; there is no tendency to suppuration. More rarely in some cases the swelling persists and increases and causes a plastic deposit upon the bone, which ends by forming a more or less large swelling which constitutes a true periostitis. Patients who have once suffered from this complication are liable to relapses and are also subject to the return of the complications if again infected with gonorrhœa. Fournier has reported a case which had three attacks of periostitis in the course of three successive attacks of gonorrhœa. The diagnosis, as a rule, is easy on careful examination, but as Fournier has noted, it may be difficult in certain rare localizations of the lesions as the acromion process of the scapula or the spinous processes; but too much stress cannot be laid upon the value of the practically pathognomonic symptom of pain on pressure over the small circumscribed area of the lesion. The prognosis is generally good, the patient, with rest and proper treatment, usually recovers; but, on the other hand, neglect is usually followed by the much greater and sometimes irremediable lesion of hypertrophic osteoperiostitis.

In the chronic form, in contradistinction to the acute, the lesion is generally found in the epiphyses and the small bones of the hand and the foot, These last are by far the more usual location, but the osteoperiostitis of the diaphysis of the long bones has been occasionally observed. The objective symptoms are the principal element in making a diagnosis, for subjective symptoms may be entirely absent. In some cases, as where the treatment of the gonorrhœa is entirely neglected, or, as the result of neglected infections, there may be a distinct tumor formation. This tumor is flat, immovable,

adherent to the bone, and gives on palpation the typical sense of resistance characteristic of bony new formation. As a rule it is small; however, it may reach a quite large size. The symptom of pain is very variable, but as a rule there is pain at the onset of the swelling, but not always so. It is not uncommon, as Jacquet has noted, in cases of pain in the heel, with hyperosteosis, for the pain to be very severe on each attempt at walking, and to really make the patient an invalid. Rarely is the skin altered, but in some cases, at the onset, it may be inflamed. The nodulated form of gonorrhœal rheumatism, described by Fournier and Amaral under the name of "progressive pseudo-nodulated deforming polyarthritis" must be considered. This disease consists in a peri-articular swelling, affecting usually the extremities of the phalanges or the metacarpal bone or the big toe. Rarely primary, the lesions are usually consecutive to repeated attacks. If one examines the affected region one finds on palpation a diffuse puffiness which gives the sensation of a tumor, hard as a simple, smooth exostosis, but without the inequalities and other peculiarities of the tophi of gout. No redness of the skin nor œdema exists in the region of this tumefaction, which occupies only the extensor side and the lateral face, and never the flexor side. Markedly painful at first, it soon becomes painless except on pressure. The lesion, after remaining for a long time stationary, gradually lessens, and eventually disappears. A particular characteristic of this affection is that when the lesion extends over the joint of the first with the second phalanx there results a characteristic deformity of the finger, which becomes fusiform; it is the "radish finger" of Fournier and more often affects the ring and index fingers. This deformity is pathognomonic of gonorrhœa, for although there is an analogous dactylitis in Haygarth's disease, in this all the fingers of the two hands are equally affected, while in the gonorrhœal variety only one, two, or three of the fingers are involved. A number of authors have considered this particular swelling to be the result of a slight osseous hypertrophy, and above all, of a hyperplasia of the peripheral fibrous tissue; in other words, a purely analogous condition to that of rheumatism deformans. It has been demonstrated beyond doubt that these lesions are osseous. The chronic osteoperiostitis of the diaphysis of the long bones, though rare, requires special mention. Achard and Hirtz have each reported a case in which there was a hypertrophy of the diaphysis of the femur consecutive to gonorrhœal rheumatism. This was characterized by a hard, indolent swelling, of a portion of the bone and accompanied by trophic complications consisting of extreme atrophy of the muscles of the thigh. The diagnosis of the chronic form is usually easy; it may be distinguished from the exostosis of syphilis by the fact that those of gonorrhœa are painless in contradistinction to those of syphilis, which are accompanied by the typical osteoscopic pain. The hypertrophic osteoperiostitis is essentially a chronic condition and may persist for months or years without modification despite appropriate treatment. Fournier has always noted the disease's termination by resolution, while other observers have stated as their experience that the lesion may diminish in size, but never entirely disappear. The prognosis is grave, for the reason that the disease is of indefinite duration, and during its existence the part is of necessity functionally inactive. It is even more likely to reappear or to become accentuated with each new attack of gonorrhœa.

The treatment in the first place should assist in cure of the gonorrhœa by irrigations with a solution of permanganate of potassium or nitrate of silver. Local rest is essential, especially in cases where the heel is involved. Counter-irritation is the best local treatment. In some cases local and general baths composed of equal parts of emulsion of green soap and essence of terebinthine in water, in the proportion of one to four, have proved valuable. The general bath should be given at a high temperature, 40° C., and should last about half an hour. The temperature of the local bath should be even higher, 45 or 50°, and a greater quantity of the solution should be used. In some cases massage and hydrotherapy have been followed by good results. The treatment of the pseudo-nodulous deforming polyarthritis requires especial care, for it is a difficult point to decide when the acute period has sufficiently passed to forcibly break up the immobility and when to have recourse to massage and moderate articular gymnastics without risk of provoking an acute relapse. As a general rule, this period has arrived when the peri-articular extremities are not sensible to pressure by the fingers.

THERAPEUTICS.

UNDER THE CHARGE OF

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Bactericidal Action of Rontgen Rays.—DR. H. RIEDER in 1898 began a series of observations on the bactericidal activities of the Röntgen rays, which are continued, and the further results reported. Cultures of the cholera spirillum, the colon bacillus, and the bacillus prodigiosus in Petri dishes were exposed to the action of the rays for from twenty to thirty minutes, after which time it was shown that many of the organisms were killed, and multiplication ceased in nearly all. Animal experimentation, however, has shown that these activities are not as apparent in man, and it is even questioned whether the effects of the X-rays on lupus is a result of anti-bacterial activity.—*Münchener med. Wochenschrift*, 1902, No. 10, p. 402.

Intestinal Disinfection.—M. H. GORDON has been experimenting with izal oil. The practical difficulties in the way of causing sufficiently strong solutions of disinfectants to reach the bowel are such that not many have faith in any which from time to time are presented. This oil is, unfortunately, a proprietary article, recently discovered in investigation of the by-products during the conversion of coal into coke; it has a boiling-point, is insoluble

in water, and is sold in three main preparations: (1) pure izal oil; (2) an emulsion of 40 per cent., called medical izal; and (3) an emulsion of the same strength, but not refined for medical purposes. The experiment was made by adding it in known quantity to a definite weight of fecal matter, seeking to cover the following points: (1) the total number of micro-organisms present in agar plates after twenty-four hours' incubation at 98.6° F.; (2) in gelatin plates after forty-eight hours at 71.6° F.; (3) the degree of fermentation shown by gas bubbles in series of gelatin shake-cultures, inoculated with successive tenths of feces, namely, 0.02 up to 0.000,000,002 during four days at 71.6° F.; (4) the extent of growth in broth-cultures, also inoculated in the same way at 98.6° F. during five days; (5) the growth of bacillus coli in broth after forty-eight hours at 98.6° F. In the first experiment the virulence of the feces, as shown by the virulence of the growth in broth after forty-eight hours at 98.6° F., was also determined before and after taking izal. His conclusions are from laboratory and clinical experiments that the ingestion of izal oil in doses without unfavorable symptoms diminished the number of micro-organisms in the feces to a very striking extent. Whether or not, in a long clinical application, it will be serviceable remains to be seen; but the first indications are that it is more active than most of the substances proposed for this purpose.—*Lancet*, 1902, No. 4097, p. 656.

Treatment of Chronic Malarial Fever by Quinine Hydrobromate.—Dr. G. B. Ferguson was led to use quinine hypodermically after several disappointments by stomach and rectal application. After experimenting with the different quinine salts he adopted the hydrobromate as being comparatively soluble in small amounts of water (1 : 6), and causing little or no pain following the injections. The mode of treatment, he frankly says, is not new, but has proved so efficient in obstinate cases of malaria that it is worthy of adding to the evidence now accumulating. The efficiency of the treatment is at times marvellous, and it will often cure malarial joints and malarial rheumatism. The author injects 3 grains of quinine hydrobromate dissolved in 20 minims of water into the thigh or fleshy part of the arm. Sterile water and an aseptic syringe are essential. None of the patients under treatment has needed more than six injections and in most three have been sufficient. The maximum effect of the alkaloid seems to be reached in about a half-hour after the injection, which the author believes is best given two or three hours before the expected paroxysm.—*British Medical Journal*, 1902, No. 2147, p. 439.

New Specific for Malarial Infections.—Dr. Armand Gautier has recently made some investigations with the newer organic preparations of arsenic, the cacodylates, on malaria-infected individuals. The use of arsenic in the treatment of malaria has been in vogue for many years, but its uncertain effects have made the physician rely more and more upon quinine and its salts for the actual poisoning of the parasite, and arsenic has come to occupy the position of an adjuvant to the treatment more directly applicable for the secondary anæmia which follows malarial infection. He has found, however, that in the form of the cacodylates the parasites themselves can be attacked and the patient cured. He has utilized the disodium methyl arsenate, which

has been found to be non-toxic in 1 gramme—20 kilos of animal weight. This new cacodylate salt, as he terms it, has very marked properties. In nine cases of acute severe malaria observed in Constantine, Africa, by Billet, to whom Gautier had sent the drug, hypodermic injections of from 1 to 2 grains have been absorbed very rapidly without pain or other disturbance. The effect on the patients who had been very refractory to quinine was marked. They were cured with great rapidity. Details of the cases are given.—*Les Nouveaux Remèdies*, 1902, vol. xviii. p. 73.

Pneumonia and Suprarenal Therapy.—Dr. Ethan Allen Gray contributes a suggestive article on the use of suprarenal substance in the treatment of pneumonia. He cites reports of six patients, in some of which he believes he has obtained a reaction suggestive of the abortion of pneumonia. The powerful vasomotor stimulation is cited as an essential element in the action. Three grains of suprarenal capsule are given every two or three hours.—*Medical Record*, 1902, vol. lxi. p. 527.

Treatment of Pneumonia.—Dr. S. S. Burt, in a thoroughly Nihilistic paper on the treatment of pneumonia, concludes that inasmuch as this disease is a short self-limited infection, that little should be done for it. Since high temperatures inhibit the growth of the diplococcus pneumonia, high temperature is, he holds, beneficial. Specific medication is unnecessary if not pernicious. It is imperative to disinfect the dejecta and expectoration; aconite and its congeners are injurious; opium, checking renal activity, in large doses is contraindicated; in old persons opium is exceedingly dangerous; oxygen is useful, but not indispensable; alcohol is valuable as a food, and it conserves energy; strychnine, ammonia, alcohol, and nitroglycerin in large doses, as stimulants, should be reserved for emergencies; subcutaneous infusion of physiological salt solution is invaluable for renal elimination of poisonous accumulations; last, though not least, specific remedies at best are but makeshifts; prevention of the infection is the *desideratum*.—*Medical Record*, 1902, vol. lxi. p. 647.

[Recent literature upon the creasote-therapy of this disease seems to indicate that one *desideratum* has been found.—R. W. W.]

Dionin in Respiratory Affections.—Dr. A. Scherer makes a plea for this morphine derivative in the treatment of bronchitis, tuberculosis, asthma, laryngitis, and other affections of the respiratory passages. As it is well known, its action, like that of the other morphine derivatives, depends upon the morphine base, but it is more advantageous to use, since there is less stomachic disturbance, less constipation and less euphoria, which latter makes morphine so sedative.—*Therapeutische Monatshefte*, 1902, vol. xvi. p. 126.

A New Organic Form of Arsenic.—Dr. Armand Gautier submits an account of a new arsenic cacodylate having, as he claimed, very marked curative properties. This new compound, disodicmethylarsenate, as CH_3, O_3Na_2, $2H_2O$, is formed by the action of methyl iodide on sodium arsenate in the presence of an excess of alkali. It forms in colorless crystals, is

soluble in water, slightly so in alcohol, alkaline to taste and in reaction, non-hygroscopic, efflorescent. It represents 45 per cent. by weight of arsenic. Notwithstanding this large proportion of arsenic it can be given in doses of 3 grains without poisonous symptoms. Its therapeutic dose is between ½ to 1½ grain daily. It may be taken indifferently by mouth or by means of the hypodermic needle. Gautier finds much the same indications for the use of this new salt, termed by him *arrhenal*, as for the cacodylates.—*Les Nouveaux Remèdies*, 1902, vol. xviii. p. 97.

Organotherapy in Pancreatic Disease.—Dr. H. Salmon reports *in extenso* the histories of two patients with pancreatic disease in which there were marked fatty stools (steatorrhœa) and distinct azotorrhœa—increased nitrogen elimination. In their treatment he made use of a newer preparation of the pancreas, pankreon, which had a marked salutary effect on the general metabolism and a distinctly curative effect on the fatty indigestion.—*Berliner klin. Wochenschrift*, 1902, vol. xxix. p. 120.

Bromocoll in Epilepsy.—Drs. Reich and Ehrke detail the disadvantages that are incident to the use of bromides in the treatment of epilepsy and take up the study of some of the newer organic combinations of bromide, bromipin, bromalin, and a new claimant, bromocoll, a combination of bromine, tannin and gelatin which contains about 21 per cent. of bromine. It has been shown that this combination passes into the intestines unaffected, but in the presence of an alkaline medium is broken down and liberates the bromine in some non-irritating form. The bromine is ultimately eliminated in the urine. The results of the author's experimentation tend to show that the action of this compound on the motor ganglion cells is similar to that of inorganic bromides. He found that as far as male epileptics was concerned the action of bromocoll was as marked as that of potassium bromide, but was not more active; that the remedy could be taken in large doses without disturbing the digestion, that the bromide acne appeared only when large doses were given and only in susceptible individuals, and, moreover, the eruption when it did appear healed very readily. The authors conclude that in bromocoll a good preparation has been obtained which, because of its cheap price compared with other organic bromides, should be tried in patients requiring bromide therapy.

The authors conclude as follows concerning the efficacy of bromocoll in epileptic conditions: (1) The drug approximately equals in strength potassium bromide; (2) it is pleasant to take even in large doses; (3) gastric and intestinal disturbances do not occur; (4) acne is seen only exceptionally after large quantities, and then is slight and shows a tendency to heal; (5) nervous symptoms also are rare. It is therefore indicated to try it where the bromides are not well stood, and its relatively cheap price should aid in its rapid introduction.—*Therapeutische Monatshefte*, 1902, No. 2, p. 75.

On Urinary Antiseptics.—Dr. R. Stern has shown by a series of bacteriological tests the comparative bactericidal power of a number of the older

and newer remedies. In doses of from 45 to 60 grains a day both urotropin and salicylic acid have a marked bactericidal power. They not only hinder the development of the ordinary micro-organisms, but kill them as well. Salol, camphoric acid, methylene blue, oleum santali and oleum terebinthinæ prevent the development of bacteria, but only in very large and continued dosage. Balsam of copaiba, boric acid, potassium chlorate, and uva ursi were without any action on bacteria. The author brought out the interesting feature that the administration of urotropin or salicylic acid was of great value just preceding instrumentation of any kind. In the deep seated bacterial infections, such as occur in tuberculosis, etc., the urinary bactericidal agents are of very secondary value. The author maintains that the continuous use of urotropin in typhoid to disinfect typhoid stools is unadvisable, inasmuch as large doses used over considerable intervals of time can give rise to marked if not serious kidney irritation.—*Allegemeine med. Central Zeitung*, 1902, vol. lxxi. p. 1.

[The dose of urotropin as above given is decidedly larger than is considered to be necessary.—R. W. W.]

Forman and its Applications.—Dr. H. Suchannek speaks of the limitations in the use of this new formaldehyde-containing compound, and recommends its use in the early days of an acute nasal or laryngeal catarrh in order to both render the attack milder and shorter.—*Fortschritte der Medicin*, 1902, vol. xx. p. 92.

Chronic Bright's Disease and its Surgical Treatment.—Dr. George M. Edebohls gives a complete *résumé* of the question of priority of the first advocate of the surgical treatment of chronic Bright's disease. The article is of value from the bibliographical stand-point.—*Medical Record*, 1902, vol. lxi. p. 651.

Reduction of Sodium Nitrate in the Animal Body.—Drs. C. Binz and P. Gerlinger have again gone over this entire subject. Experiments which show that sodium nitrate can act as a poison, owing to its conversion into nitrite in the animal body, have all been conducted with the relatively non-delicate iodine reaction. In the new experiments a mixture of α-naphthylamin and sulphanilic acid to test the excretions, especially the urine, was used. The quantitative estimates were made by pouring the urine into a concentrated solution of ammonium chloride, passing carbonic acid gas through the mixture and then decomposing by heating. The liberated nitrogen is then read off in a suitable azotometer and the amount of nitrite calculated from this. In all the animals tested appreciable amounts of nitrites were found in the urine, and the presence of methæmaglobin in the blood was manifest by its brown color and the grayish tinge of the mucous membranes. The experiments are interesting not only from a toxicological point of view, but also in that they prove that a true reduction may go on in the body. Owing to the small therapeutic doses, little need be feared from this process in man.—*Archives Internationales et Pharmacodynamie et de Therapie*, 1902, vol. ix., fasc. 5 and 6, p. 441.

GYNECOLOGY.

UNDER THE CHARGE OF

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Leucocytosis in Pelvic Suppuration. — DUTZMANN (*Centralblatt für Gynäkologie*, 1902, No. 14), from observations in forty cases of pelvic disease, arrived at the conclusion that hyperleucocytosis is of great value as a diagnostic sign. In several cases the presence of pus was established in the absence of the usual symptoms. In one instance, with 16,000 white cells to the cubic millimetre, the temperature was actually subnormal. On exploring the uterus and evacuating pus the number fell to 6800. In another, in which the count was 17,800, with a low temperature, the diagnosis of fibroma or hæmatocele was made, and laparotomy was about to be performed, when an abscess ruptured into the rectum, the number of leucocytes dropping to 8300. Again, the writer found no increase in the leucocytes in cases diagnosed as salpingitis and mural abscess, his opinion being invariably confirmed by operation. Another interesting fact was the hyperleucocytosis observed in cases in which abscesses had been imperfectly drained.

Degeneration of Uterine Fibroids.—CULLINGWORTH (*Journal of Obstetrics and Gynecology of the British Empire*, 1902, No. 1) reports 100 cases of operations for uterine fibromyomata; in 52 of which the specimens showed more or less evidence of degenerative changes. Of these 27 were myomatous, 5 fibrocystic, 18 necrotic, 1 sarcomatous, and 1 calcareous.

The writer lays especial stress upon the age of the patient, myxomatous degeneration being most common between forty-two and fifty-two, while necrosis was noted in patients between thirty-six and forty-six years of age. Pain was a marked symptom in 38 cases, especially in connection with necrosis and cystic degeneration.

Peritoneal Adhesions.—KATOUNSKY (*Wratsch*, 1901, No. 29) calls attention to a class of cases in which a broad ribbon-like adhesion extends from the sigmoid flexure to the parietal peritoneum. The cause of this condition has not been explained, though Gersuny has attributed it to traumatism, or to the escape of blood into the peritoneal cavity during menstruation. The symptoms are somewhat vague, such as pain in the hypogastrium, dyspareunia, and obstinate constipation. Pain is experienced on palpation over McBurney's point and over the sigmoid. There is tenderness on vaginal palpation, even when the pelvic organs are normal. The writer admits that a positive diagnosis cannot be made.

Castration for Uterine Fibroids.—KAKOUSHKINE (*La Gynécologie*, February, 1902) reports 105 operations by Russian surgeons. The tumors were nearly all of large size. The mortality was 6.6 per cent., as compared with 9 per cent. in 300 cases reported by Zavarikine and 8.5 per cent. in 900 cases by Olshausen.

In the writer's cases the tumor diminished in size in 72 per cent., remained stationary in 25 per cent., and increased in 3 per cent Pain was relieved in 40 per cent., diminished in 35 per cent., and was not relieved in 25 per cent. He is opposed to the operation.

Formalin as an Intra-uterine Application.—MENGE (*Centralblatt für Gynäkologie*, 1902, No. 13) calls attention to the superior excellence of formalin as an escharotic as compared with chloride of zinc. He employs both the pure drug and the 50 per cent. solution. It is especially valuable in cases of endometritis following abortion and labor at term, a single application often being sufficient to stop hemorrhage and foul discharges. The writer is strongly opposed to intra-uterine injections of caustic solutions.

Vaginal versus Abdominal Myomectomy.—MARTIN (*Centralblatt für Gynäkologie*, 1902, No. 14) emphasizes the fact that since the indications for myomectomy have been so much extended it is important to select a method of operation which gives the best remote as well as immediate results. He is strongly in favor of the vaginal route. The size of the tumor is not in itself a contraindication, since growths of large size can readily be removed per vaginam by morcellation. On the other hand, in the presence of firm suprapelvic adhesions, especially intestinal, the abdominal route is preferable; but deep pelvic adhesions and intraligamentary tumors are best handled from below.

The writer fears injuries to the bladder and ureter more than he does hemorrhage, especially the former. He has never injured the ureters during vaginal myomectomy, though this accident has frequently occurred in his abdominal operations. When it is possible he enucleates tumors without removing the uterus. In young women he tries to leave one ovary. The writer reports the results of his work during three years at the Greifswald clinic—87 vaginal and 31 abdominal myomectomies. The latter were all complicated, and 6 terminated fatally. Of the vaginal operations 35 were total hysterectomies, with no deaths, and 52 were enucleations, with 2 deaths.

Transverse Abdominal Incision.—FELLENBERG (*Centralblatt für Gynäkologie*, 1902, No. 15) reports 70 cases in which Küstner's transverse crescentic incision was made through the skin. The advantages are not only cosmetic, but by opposing a superficial transverse to a deep vertical incision there is less danger of hernia. It is used only in cases in which a small wound is necessary and pelvic drainage is not required.

The disadvantages of this method are the necessity of dissecting off the skin and adipose layer from the subjacent fascia over a considerable area, and the consequent impairment of the chances of primary union. In fact, it occurred in only two-thirds of the cases. Drainage of the skin wound is recommended.

OBSTETRICS.

UNDER THE CHARGE OF

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Complete Rupture of the Uterus, followed by Total Abdominal Extirpation.—AMANN (*Centralblatt für Gynäkologie*, 1902, No. 5) reports the case of a woman in her fifth labor on whom attempts at version had been made to deliver a child in transverse presentation. A second version had proved successful, but the physician at the time had diagnosed rupture of the uterus and had introduced a tampon of gauze.

When the patient was brought to the hospital she was exceedingly pale and with a very rapid and frequent pulse. Transfusion was at once administered and the abdomen opened. An extensive and complete laceration of the uterus was found, filled with the gauze packing and also with several loops of intestine. The rupture had occurred near the peritoneal fold covering the bladder, extending upward upon the right side and practically tearing away the uterus at its cervical junction at the anterior vaginal wall. The round ligament on the right side was torn asunder, but did not bleed. The tear in the peritoneum extended upward on the right above the broad ligament and beneath the cæcum, so that the bowel was loosened from its peritoneal attachment. The bladder was entirely separated from its peritoneal attachment to the uterus. There was blood in the abdominal cavity and meconium in the vicinity of the liver. Total extirpation of the uterus was at once performed, the peritoneal edges being united as completely as possible and a gauze drain placed in the vagina. The patient was freely stimulated. On the following day urine escaped through the vagina, but this terminated on the fifteenth day. On the eighteenth day the patient was discharged convalescent, having not had an abnormal temperature.

Amann has collected statistical information upon the subject, and finds that in cases where the uterus has been ruptured with wounds of the bladder, out of fifteen collected by Klien but two recovered. In complete lacerations, the closure of the lacerated womb gave a mortality of 53 per cent. When the child was removed through the vagina and the uterus then closed, the mortality was 47 per cent. Supravaginal amputation of the ruptured uterus gave a mortality ranging from 45 to 42 per cent. The entire removal of the ruptured uterus through the abdomen had been performed thirteen times, with seven deaths. Of late years the vaginal extirpation of the ruptured uterus has been urged as the best method of operation. Of nine cases collected by the writer six perished, but this mortality must be considered as excessive.

Those cases treated without operation, but by drainage by gauze, show a considerable percentage of recovery. In 198 cases of rupture treated with-

out operation 48 per cent. recovered and 52 per cent died; 42 of these cases were treated by drainage with gauze or with the drainage-tube, and, of these 42, 35 recovered, or 83 per cent.

It seems evident that the result of rupture of the uterus depends more upon the circumstances of the case and the extent of the rupture than upon the method of treatment. Where the rupture is complete the mortality is high under any form of treatment. Where the rupture is incomplete and but a small portion of the fœtus, if any, escapes into the abdominal cavity, the treatment by drainage with gauze gives the best results yet obtained. It is worthy of note that what is called "secondary operation" through the abdomen gives a better result than primary operation. By the term "secondary" is meant the fact that the operator removes the child through the vagina before opening the abdomen to care for the uterus. Whenever possible, the vaginal removal of the child and appendages lessens slightly the mortality for the mother.

The Duration of Pregnancy.—In the *Centralblatt für Gynäkologie*, No. 2, 1902, SCHULTZE criticises the ordinary nomenclature describing the length of pregnancy. The 280 days comprising the ordinary pregnancy are usually divided into ten periods, and these are called months. This, however, is incorrect, for the term month refers to changes of the moon, and ten lunar months comprise 295 or 296 days. If this usage be referred to Hypocrates, it is again incorrect, for he divided pregnancy into four decades or seven periods of forty days each.

The better nomenclature is that which considers the period of pregnancy as composed of ten periods during which the regular menstruation is missed. In this manner the patient is not misled in counting the time of confinement, and confusion is avoided. Schultze calls attention to the fact that in his text-book for midwives this usage is successful, and that he has always recommended it with approbation in various papers and articles upon the subject.

A Case of Sympus or Mermaid.—In the *Maryland Medical Journal*, January, 1902, STOKES and MCNEER describe the case of an unusual monstrosity, the mother, a white woman, having other healthy children. This monster was born at eight months' gestation, the birth being normal in character. The lower limbs were fused together; there was no true pelvis present, the pelvic bones being a solid platform at the extreme lower end of the abdomen. The sigmoid flexure of the colon ended in a large blind pouch. There was no trace of the rectum and no attempt of the alimentary canal to open externally. There was no bladder, but a small, firm, round body, about the size of a pea, resembling a prostate gland. No sexual organs of any kind could be discovered. The ureters ran downward and slightly forward on each side, emptying into the blind pouch in the pelvis at its lower portion.

Total Inversion of the Uterus.—AMANN (*Monatsschrift für Geburtshülfe Gynäkologie*, 1902, Band XV., Heft 1) reports the case of a patient greatly emaciated who complained of total prolapse of the uterus which had been

present for some years. For the last two weeks the prolapsed mass had been increasing in size. The patient had bled excessively and had become much emaciated. There had been fever and pain in the prolapsed tissue. Upon examination a completely prolapsed uterus, to which was attached a fibroid tumor, was found. The mass was removed by vaginal section and the stump stitched into one angle of the wound, and the bladder peritoneum untied to the tissues of the anterior vaginal wall. A drain of iodoform gauze was inserted. The patient did well immediately after the operation, but finally succumbed to pyæmia.

Spurious Abortion.—In the *Medical Chronicle*, October, 1901, FOTHERGILL reports the case of a young woman who had already borne a child. She missed one menstrual period, and symptoms of early pregnancy were present. Inevitable abortion shortly afterward commenced, and the case was treated by tamponing the vagina with a strip of lint. The next morning the tampon was removed and a cast of the uterus was found to have been expelled. It was placed in formaldehyde solution and afterward examined. The patient made an uninterrupted recovery.

The study of the case showed it to be composed of typical decidual tissue. The uterine epithelium was unaltered on a considerable portion of its surface. The uterine glands were unaltered in the deep layer, but dilated and without their epithelium in the middle and superficial layers. There were numerous large decidual cells and spaces filled with fresh blood. No villi or chorionic epithelium were present. Upon examining the body expelled by a large number of sections, it was shown that it was a complete ovum, consisting of a sac of chorion only, and covered completely with chorionic villi. No amnion or germinal area was found. This case is an illustration of an early missed abortion in which the decidua went on growing for some time after the death of the ovum. The practical importance of the case depends upon its relation to the diagnosis of ectopic gestation.

When a decidual cast is passed without any portion of the ovum, the patient should be most thoroughly examined to detect a possible ectopic gestation.

Dystocia following Ventrofixation.—In view of the frequency with which ventrofixation is performed for the cure of retroversion, cases illustrating the permanent results of this operation are of value. BLOOMHARDT (*American Medicine*, January 11, 1902) reports three cases seen within three years in which dystocia occurred as the result of ventrosuspension of the womb. In the first case the patient was placed upon the table for the Cæsarean operation, and in cleansing the vagina the breech of the child was felt presenting. A macerated fœtus was shortly afterward delivered. Earlier in labor the cervix was drawn strongly backward and available with difficulty for examination. In the second case the cervix was high up, very small, and in a posterior position. No fœtal part could be reached through the vagina. Cœliohysterectomy was performed and a living child extracted. The mother recovered. In the third case a multipara was in labor for several days. Nothing could be discovered in a vaginal examination without anæsthesia. Under chloroform, by the insertion of the hand, a small cervix admitting one finger could be detected posteriorly and above the

pelvic brim. The cervix could not be brought down. The patient was greatly exhausted and cœliohysterectomy was performed. Mother and child died. The fundus was firmly adherent to the wall of the abdomen by dense adhesion, two inches long and one inch wide, just above the pubes. The silkworm-gut sutures were firmly embedded in the adhesion. The cervix was drawn out to a length of possibly five inches almost in the shape of a narrow cone.

A Remarkable Case of Puerperal Phlebitis.—In the *Gazette hebdomadaire de Médecine*, December 19, 1901, PINATELLE reports a remarkable case of puerperal phlebitis from the wards of the hospital at Lyons.

The patient was aged thirty-five, and gave a good family history and had had no previous disease. At twenty-two years of age she had a normal confinement at full term. Eight or nine days after this she developed a double phlebitis of both lower extremities. The tissues swelled rapidly and the swelling extended to the abdominal wall. There was no œdema of the lower limbs. For two months the patient had fever at evening, and for four months she remained in bed. At the end of six months she was able to walk. She had œdema between the malleoli, and three years afterward a varicose ulcer upon the internal aspect of the left leg. Since that time the patient had not been pregnant, nor had she been ill. She had, however, passed through two attacks of phlebitis. The first was eleven years after her confinement and obliged her to remain in the hospital three and a half months. She had fever much of this time. The pain and swelling were limited to the left side of the abdominal wall. The vessels appeared like cords of considerable size, reddened and very sensitive to the touch.

Two years after this attack she returned to the hospital with the following history: She had been seized with a sudden sense of oppression, had lost consciousness and had fallen. A fresh attack of phlebitis developed, localized in the right half of the abdomen along the borders of the ribs and toward the tip of the sternum. On entering the hospital the patient's temperature was subnormal and the phlebitis was ascending and had reached the internal mammary vessels of the right side. Enlarged veins could be traced upward from the brim of the pelvis, forming a complete chain. The patient suffered pain, with great variation, sometimes escaping suffering entirely. There was no derangement of motion or of the heart sounds; there was no œdema of the face or arms; the examination of the viscera was negative. Upon examining the abdomen the enlarged veins could be felt, but the abdomen was not distended. The heart was normal, the pulse 82; there was no sign of disease of the respiratory organs and the urine was normal. The patient menstruated irregularly and longer than normal, without much suffering, and had no symptoms of pelvic disease. She was neurotic to a considerable degree. The treatment consisted in making gentle pressure by bandages of thin flannel, rest in bed and attention to the functions of nutrition and excretion. Two months after admission the patient left the hospital considerably improved.

[This case lacks a very interesting and essential element in diagnosis—the examination of the blood. It can hardly be imagined that so extensive a condition of disease should not have been attended by an altered state of the blood.]

OPHTHALMOLOGY.

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Tuberculosis of the Cornea.—GREEFF (*Fortsch. d. Med.*, No. 22, 1901). While tuberculosis of the cornea does not occur so frequently as tuberculosis of the conjunctiva and uveal tract, late researches have shown that it is not so very rare. In 1879 Hænsell showed experimentally that the injection of tubercular matter into the cornea of the rabbit and guinea-pig caused an outbreak of tubercles. He, however, doubted the occurrence of primary tuberculosis of the cornea. It is now certain that this occurs, although it is much more frequent as a secondary process following primary tuberculosis of the uveal tract.

The clinical picture of tubercular disease of the cornea shows great variations. In some cases a typical parenchymatous keratitis occurs. In such cases the primary tubercular nodules are situated in the iris, and especially in the ligamentum pectinatum. According to Bach, the parenchymatous inflammation is caused by diffusion of the toxins of the bacilli within the corneal tissue. The original nodules in the ligamentum pectinatum may also extend into the cornea.

More frequently the affection takes the form of so-called sclerotizing keratitis. In such cases tubercular nodules very gradually penetrate into the deepest layers of the cornea.

In primary tuberculosis of the cornea the nodules arise in the sclero-corneal junction or in the most peripheral portion of the cornea itself. These nodules extend very gradually a little into the cornea, and heal with obliteration of the corneal margin in loco eruptionis, or leave a tongue-like, grayish-white opacity extending into the cornea.

Ulcerations of the cornea are also occasionally tubercular. Such torpid richly vascular ulcers are most frequently found when lupus of the face extends to the cornea

It is noteworthy that tubercle bacilli grow with great difficulty in the tissue of the cornea, so that in undoubted cases of tuberculosis the bacilli can very rarely be found in the cornea itself. The evidence of a tubercular nature in these cases is only the histological examination, or Cohnheim's experiment, that is inoculation of a particle in the anterior chamber of a rabbit.

The Clinical and Anatomical Fundus Changes in a Case of Splenic Leukæmia.—Since Liebreich's first description of the retinal conditions in

three cases of leukæmia forty years ago the ophthalmoscopic findings in this disease have been quite numerously reported. The anatomical changes in the retina, on the other hand, have been rarely recorded, so that every such case histologically examined must be regarded as a not unimportant contribution, especially, if as in the case to be reported, besides confirming some points already known, changes not yet observed are brought to light.

Bondi (*Prag. med. Woch.*, No. 26, 1901) reports the ophthalmoscopic appearances and histological changes observed in a case of splenic leukæmia. Male, aged thirty-four years, entered the hospital February 6, 1893; death took place December of the same year. The patient had noticed in April, 1892, ten months before admission to the hospital, a firm, slowly increasing growth in the upper part of the abdomen on the left side. There was a dull pain, and in walking a feeling of fulness, frequent bleeding from the nose and gums. Examination of the internal organs showed enormous enlargement of the spleen, moderate dilatation of the heart, slight enlargement of the liver, especially of the right lobe. The blood-count gave a ratio of white to red cells as one to four, which afterward increased to one to three.

Ophthalmoscopical examinations were repeatedly made. Upon admission to the hospital the visual acuity in both eyes was normal. There were no subjective ocular symptoms. Pathological changes in the fundus began in the middle of May. These consisted of abnormal fulness of the veins and a small hemorrhage between the papilla and the macula. The visual acuity and field remained even yet entirely normal. May 28th there was great enlargement of all the retinal veins in both eyes and a small retinal hemorrhage in the right eye; no other abnormal findings. The color of the fundus was not changed from the normal. October 11th a change in the papillæ could be noted for the first time. The edges of both were indistinct, the right somewhat more so than the left. The veins were tortuous and enlarged; visual acuity in both eyes 6/18. November 5, papillæ pale, margins indistinct, veins enormously enlarged. November 17th, small, whitish-yellow spots scattered in a large radius about the papillæ, extending far into the periphery of the fundus, the veins being enormously enlarged and tortuous. The color of the fundus hardly changed; the large vessels were, however, somewhat paler than normal; visual acuity 6/36 (?) in both eyes. No decided change occurred in the ophthalmoscopical findings up to the time of death. The last examination was made fourteen days before death.

The autopsy showed leukæmia, swelling of the liver and spleen, leukæmic infiltration of the medulla of the bones, and multiple infarcts of the spleen.

Histological findings of the intra-ocular structures: Papillæ slightly swollen. It was, however, the retina which showed the most marked changes. Its enormously dilated vessels were filled to bursting with blood; in some it was hardly possible to find a single red corpuscle. Where a relatively large number of red blood cells existed the red cells occupied the centre and the leucocytes the peripheral portion of the vessel. The blood contents presented another important phenomenon—intravital coagulation. Some vessels of medium calibre in the equatorial region were entirely thrombosed. The perivascular lymph spaces were everywhere enlarged and often filled with leucocytes. Accumulations of pigment were also sparsely found

at some points. The infiltration of leucocytes was not confined to the perivascular lymph spaces; it extended into the nerve-fibre layer, and at some places penetrated as far as the inner granular layer.

There were also extravasations of blood into the retina. Like the leukæmic infiltrates, these were most common in the peripheral portions; although generally found near the vessels, they were occasionally seen at distant points. All the retinal layers were involved, the external layers especially. The hemorrhages were almost exclusively formed of well-preserved erythrocytes. The nerve fibres also showed degenerative changes, as did the remaining layers. At one point the retina was totally atrophic with deposit of pigment.

The choroid was intimately adherent to the sclera near the papilla. Its vessels, like those of the retina, were enormously dilated and filled to bursting, almost exclusively with leucocytes. Leukæmic infiltration into the choroid was entirely absent. The anterior section of the eyeball was entirely normal. The only change in the nerve and its sheaths outside of the over-filling of the vessels consisted of a certain amount of nuclear proliferation.

The ophthalmoscopical and anatomical findings in this case are partly in accordance with other cases of leukæmia previously observed. Certain other conditions emphasized by some observers are conspicuous from their absence. The yellowish or orange color of the fundus, which has passed into the text-books as characteristic of leukæmia, was not observed at any stage of the disease in this case. The enormous dilatation and tortuosity of the retinal veins, which constituted the most marked pathological change in the fundus, agrees with the testimony of observers in general. The arteries were not enlarged; so, likewise, the hemorrhages and yellowish-white spots in the retina are usual.

The preservation of the visual acuity is to be noted. The vision only became affected in the last two months of the disease—a fact quite explicable from the anatomical conditions.

Histologically, this case is unique in the extensive dilatation of the perivascular lymph spaces in all parts of the fundus, proliferation of the pigment, and thrombosis of the retinal veins. In other respects the anatomical changes agree with those previously found.

A true connection, as Liebreich first pointed out, exists between leukæmia and disease of the fundus. It is more than questionable, however, whether the process is an inflammatory one. It may be best to drop the term "retinitis." The point of departure of the disease is the vascular system of the retina, although inflammatory changes in the vessel walls cannot be shown to occur. Slowing of the blood-current, especially in the capillaries and veins, takes place in the peripheral vessels. This happens the more readily because the contents of the vessels are so largely made up of the sticky white blood cells; these adhere to the inner surface, and thus interfere with the proper circulation; thence follow dilatation of the veins, transudation first into the lymph spaces, then into the nerve fibres and ganglion layers, with destruction of those elements. The retinal hemorrhages, especially those in the macula lutea, contribute to lower the vision.

OTOLOGY.

UNDER THE CHARGE OF

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Experimental Studies concerning the Conduction of Sound in the Skull.—HUGO FREY (*Zeitschrift für Psychologie u. Physiologie der Sinnesorgane*, Band xxviii, Heft 1). How far bone conduction is a factor in hearing—*i. e.*, how great a part of the waves of sound in the air passes by means of the external auditory canal to the end apparatus of the acusticus, and how great a part, impinging on the surface of the skull, passes directly to the end apparatus, has long been a disputed question in the physiology of the ear. As a first step toward the solution of this question Frey has carried out some interesting experiments on the method of transmission of sound through bones. He has attempted to answer the following questions, leaving the solution of the above problem for later researches:

1. In what way is sound conducted in human bone tissue in general, and what influence has the structure of the bone upon conduction?

2. How does the conduction in macerated bone compare with that in fresh bone?

3. In what manner are waves of sound conducted in the bones of the skull; to what extent does this take place, and in what way?

4. How does this compare in a macerated skull with that in a fresh skull?

The method of investigation chosen is as follows: A tuning-fork with a handle fitted with a thread is screwed into the bone, and a microphone, which can be placed by means of a stylet upon any neighboring part of the bone, is used to conduct the sound to the ear of the observer. A stop-watch is used to determine the duration of the sound from the time the tuning-fork is set in vibration to the time when the sound ceases to be heard through the ear-piece of the microphone. To ensure an equal sounding of the tuning-fork a piece of shot is dropped from the same height in each experiment on the prongs of the tuning-fork. A mean of twelve results in each position of the microphone guards against subjective errors.

The first series of experiments is conducted on the human femur, the tuning-fork being screwed into the bone at the upper end between the neck and the great trochanter, so that the tuning-fork prolongs the long axis of the bone. A macerated femur, and then a fresh femur with adherent soft parts, is used. The following conclusions are derived from the experiments:

1. The femur conducts sound waves, which are brought to it directly and in its long axis, chiefly in its compact substance and in the long axis of the bone.

2. Taking the sound that comes to the microphone as a measure for the sound conduction, this takes place better sometimes through the compact bone and sometimes through the spongiosa. It is better in the compact compared with the spongy bone, according to the preponderance of the former.

3. This holds good for the fresh femur with soft parts adherent as well as for the macerated bone.

The conditions of sound conduction in the skull are next studied—first on a macerated and then on a fresh skull. The tuning-fork handle is in these experiments passed through the external auditory canal and screwed into the promontory wall of the middle ear, and the stylet of the microphone is placed at various points on the skull. Two tuning-forks of different pitch, and consequently giving off waves of different length, are used for greater exactness, but the results are relatively the same. The following results are obtained:

1. The direction which waves of sound conducted directly to the bones of the skull take is dependent on the density of the bone-substance.

2. When, therefore, waves of sound proceed from the hearing organ of one side they spread out over the whole skull, but they are conducted *especially* to the symmetrical point of the other side of the skull.

3. There exists, therefore, a conduction of sound from one ear to the other by bone. This may be carried by conduction through the bone alone without the chain of ossicles (Schalleitungskette) playing necessarily any essential part.

4. This is true of the macerated skull, and as well of the fresh skull with adherent soft parts. Frey believes that his experiments show that the peculiar construction of the bone in the vicinity of the ears (the pyramids consist of the hardest bone of the body) explains the conduction of sound from one ear to the other.

Two Physiological Reports Concerning Acoustics.—A. LUCAE (*Archiv. f. Ohrenheilkunde*, Band liv., Heft 3 und 4). The first of these reports is concerned with the function of the membrane of the round window.

1. A hitherto unrecognized way in which the so-called artificial drum membrane acts. Lucae is here not concerned with the well-known action of the artificial drum membrane in cases of isolated stapes where the piece of cotton or rubber making the artificial drum membrane is placed directly on the head of the stapes, and where the improvement in hearing is, in the author's opinion, due to increase of intralabyrinthine pressure. He is concerned with the results which he has obtained by placing a wad of cotton on the promontory wall in cases of chronic middle-ear suppuration which have run their course, leaving a loss of drum membrane and absence of the malleus and incus. In a series of such cases, under observation for several years, Lucae has been struck by the improvement in hearing which has resulted when the wad of cotton rested upon the forward part of the promontory wall without touching either the stapes or round window. In some cases—those where the presence of the wad of cotton sets up a slight reaction with consequent thickening of the mucous membrane covering the promontory—the improvement in hearing was permanent even after the cotton was removed. The results in these cases can, according to the author, be explained in the following way: In these cases the waves of sound are conducted to the interior of the cochlea simultaneously through the promontory and the two windows, of which two latter probably only the round window plays any considerable part. In the cochlea, on account of this double conduction, the

two sets of waves come to interfere, and hence a lessened perception results. By means of the wad of cotton the conduction through the promontory wall is excluded, the interference no longer takes place, and, therefore, an improvement in hearing comes about.

2. A successful operation on the round window. The operation was performed on a woman forty-one years old, suffering from progressive deafness, with distressing subjective noises. The whispered voice was heard on the affected side 0.8 m. Drum membrane was relaxed. Lucae's hammer tuning-fork c^4 was heard $\frac{23}{60}''$—. Since, notwithstanding treatment for one month with massage, no improvement resulted, the excision of the drum membrane and extraction of the malleus and incus were undertaken. No improvement followed this operation, and, accordingly, since the first operation showed that the round-window niche, which was easily accessible, was blocked by two exostoses arising from the borders of the niche and touching in the centre, wholly occluding it, a second operation was performed. The exostoses were removed by means of a small burr driven by an electric motor. There was no escape of labyrinthine fluid, which showed that the membrane of the round window was not punctured. The improvement in hearing after the operation was considerable (from 0.8 m. before the operation to 3 m. for the whispered voice about two months after the operation), and the distressing character of the subjective noises was lost. The same c^4 hammer-fork was heard after the operation 32″, an increase of 10″.

Lucae believes that a bony closure of the niche of the round window may be found in any age, even in children, and that in cases of so-called sclerosis the condition of the niche of the round window should be examined, and, when necessary, the above operation, which is quite free from danger, undertaken.

The second report concerns the vibrations of the drum membrane in the living ear, caused by tones, and is an extension of the author's work on the movements of the sound-conducting apparatus when the movement is caused by condensation and rarefaction of the air in the external auditory canal (*Archiv f. Ohrenheil.*, Band liii.). By means of the simultaneous conduction of the sound from two closed whistles of 128 d.v. and 133 d.v. by means of a T-rubber tube to a Siegle speculum, and so to the drum membrane, the latter will receive five beats in the second. By means of the stroboscope and looking through the Siegle speculum one can directly observe that the posterior-superior quadrant of the drum membrane, and that only, vibrates in sympathy with the five beats. Now, according to Helmholtz, beats can come about in an elastic body through sympathetic vibration only when both the tones which arouse the beat are near enough to pitch to the fundamental tone of the elastic body, so that the latter can be set in sympathetic vibration by both tones. It therefore follows that for deep tones the posterior-superior quadrant of the drum membrane is set in sympathetic vibration, and this agrees with the anatomical facts. For it is the posterior-superior quadrant of the drum membrane which is the most loosely stretched of any part, as is shown, for example, by the often-observed fact that in pathological retraction this part is frequently thrown into folds. Lucae promises further investigation with high tones.

DERMATOLOGY.

UNDER THE CHARGE OF

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Case of Gangrene in a Newborn Child.—E. B. BRONSON (*Journal of Cutaneous and Genito-Urinary Diseases*, December, 1901) reports a case of superficial, dry, black gangrene occupying the cheek, ear, neck, chest, and hand, which he saw on the fourth day after birth. Immediately after birth it was observed that one side of the face looked black and crusted, and on being touched was "hard, like a board." No local causes for the gangrene could be discovered. The general condition of the child at birth was good, but two months later it was bad. About a week after birth the slough began to detach itself, and by the tenth day had entirely separated, leaving a healthy granulating surface, which within three weeks had entirely healed. Two months afterward the disfigurement was less than would have been expected. (A portrait showing the diseased areas accompanies the article).

The Effect of the Rontgen Ray upon the Skin in Normal and Diseased Conditions.—SCHOLTZ (*Archiv f. Dermatologie und Syphilis*, Band lix., Heft 1, 2, 3), as the result of an experimental, histological, and clinical study of the effects of the Röntgen ray upon the skin in healthy and diseased conditions, concludes as follows: The Röntgen rays themselves are the only, or at least the essentially, active factor in producing the effects peculiar to them. Their effect upon the skin occurs not only at the point of their entrance, but also at the place of exit, and appears always only after some days, reaching its acme, as a rule, after some weeks. A bactericidal effect occurs only to an insignificant degree, and scarcely plays any rôle therapeutically. The rays affect preferably, or exclusively, the cell elements of the skin, which undergo a slow degeneration. This degeneration is manifest chiefly in the epithelial cells, and in a less degree in the cells of the glandular organs, of the vessels of the musculature, and of the connective tissue. The phenomena of this degeneration are of a manifold kind, affecting the nucleus as well as the cell-body. As soon as the degeneration of the cell elements has reached a certain degree phenomena of inflammatory reaction appear, as dilatation of the vessels, imbibition of serum by the tissues, and abundant emigration of white blood-corpuscles. The changes in the vessels probably have much to do with the further development and the slow healing of the ulcerations.

The author employed the Röntgen ray treatment in about two hundred cases of various forms of disease of the skin, with more or less favorable

results. In lupus vulgaris this method of treatment is preferable to the methods hitherto used, not only because it is painless and gives good cosmetic results, but because it is followed by definite cure. In cases of lupus erythematosus vigorously treated excellent cosmetic results were obtained, but recurrences took place after some months. In cases treated mildly for some months an apparent complete cure was obtained. In the treatment of diseases of the scalp and beard by this agent, the good results are chiefly due to its very excellent depilatory effect. In favus and trichophytosis its bactericidal effect is not to be taken into account. In sycosis and folliculitis barbæ, apart from its depilatory action, the ray seems to exert a favorable influence upon the tissues. In mild cases definite cure may follow its use, but in severe ones relapses occur with the return of the hair. In the various forms of acne the treatment was useful, but not more so than those formerly employed. In eczema favorable results were frequently obtained. In all the cases of psoriasis treated the Röntgen ray exerted a remarkable influence upon the eruption. In most patients an almost complete, and in some an absolute, disappearance of the disease took place in a comparatively short time; but relapses were not prevented. In a case of carcinoma of the nose no carcinomatous tissue could be demonstrated with the microscope after treatment for some weeks. The author concludes that this method of treatment is a very interesting and active one in diseases of the skin, and that with improvement in the technique still further advances will be made in its use.

The Treatment of Lupus Vulgaris with Permanganate of Potash.—HALLOPEAU and FOUQUET (*Annales de Dermatologie et de Syphiligraphie*, 1902, No. 1), at a séance of the Société Française de Dermatologie et de Syphiligraphie, presented a patient with a severe and intractable lupus of the leg which had been treated by local applications of permanganate of potash and curettement. Compresses wet with a solution of the strength of 1 : 120 were constantly applied to the affected parts; under the influence of this application the rebellious ulcerations, which had resisted treatment for years, completely cicatrized and the vegetations disappeared. This application was well borne, although in a case of lupus of the face it produced a subacute dermatitis.

Brooke's Paste in Infectious and Inflammatory Diseases of the Skin.—DREYER (*Dermatologische Zeitschrift*, Band ix., Heft 1), induced by the very favorable results obtained with it in sycosis, has employed the paste recommended by Brooke for various scrofulodermata in a number of other infectious and inflammatory affections of the skin with excellent effect. In five cases of sycosis thus treated results followed more quickly than with any other remedy, the eruption disappearing in from four to five weeks. In furunculosis the effect of the paste was so satisfactory that the author believes it can be employed to the exclusion of all other methods of treatment. The composition of the paste is as follows: Hydrarg. oleat., 28.0; vaselin. flav., 14.0; zinci oxid., amyli, āā 7.0; acid. salicyl., ichthyol, āā 1.0.—M.

A Case of Tuberculous Paronychia from Inoculation.—DALOUS (*Annales de Dermatologie et de Syphiligraphie*, 1902, No. 3) reports a case of paronychia

resulting from inoculation. The patient, a medical student, having produced a slight excoriation in the nail furrow of the left ring-finger in cleaning his nails, performed an autopsy next day upon a tuberculous subject, and again scratched his finger in the same place upon a broken rib. Three weeks later a small paronychia occurred at the side of the nail, which was opened, giving exit to laudable pus. Under wet dressings the wound seemed to heal and the pain disappeared. Suddenly the redness reappeared, the epidermis was lifted up along the ungual furrow, and purulent oozing began. Microscopical examination of three whitish points observed in the nail-furrow at this time showed what were thought to be tubercle bacilli. The finger remained tender, and from time to time there was a slight serous oozing. Later the left epitrochlear gland became slightly enlarged; it was then decided that the affection was tuberculous, and the entire lesion was excised. The histological examination of the excised tissues established their tuberculous nature.

Granuloma Annulare.—CROCKER (*British Journal of Dermatology*, January, 1902), under the above title, reports six cases of an affection which he believes belongs to a special type of disease midway between the inflammations and the neoplasms. These cases were characterized clinically by the presence of nodules or papules, which developed slowly, with a tendency to form circles. Through slow involution the circles were broken up into crescents or gyrate patches. The lesions were violaceous red or quite pale. They were firm, some being slightly warty, others flat like lichen planus. They were distributed chiefly on the wrists, the backs of the hands and fingers, and on the neck. They were observed also on the head behind the ears, the upper part of the face, and on the lower extremity over the knee. They seemed to have a preference for the bony prominences, as the knuckles, the radial and ulnar extremities, etc. Microscopical examination of a papule showed that it was composed of a dense mass of cells situated between two hair follicles which were partially included within the cell mass. The horny layer was but little increased, but the prickle cell layer was greatly thickened. In the central portion the papillæ were obliterated, but not at the periphery, where they were broader than normal. A sweat-coil beneath the cell mass showed cell infiltration. Some of the hair follicles in the neighborhood of the papule showed a moderate amount of cellular exudate. Upon the whole, the structure of the papule appeared to be that of a granuloma.

Rheumatic Urticaria with Pigmentation.—BOSANQUET (*British Journal of Dermatology*, February, 1902) reports the case of a girl, eight years old, who had suffered from an eruption of three months' duration, which began as "large white lumps" upon the hands and arms, appearing later on the thighs and legs. The lesions appeared suddenly, and lasted about six hours, leaving dark bluish-black stains. There was slight itching and sometimes actual pain. The patient had had rheumatic pains in the limbs for some years, and the pains became worse during the eruption, the wrists, ankles, and knees swelling. The entire surface of both arms and legs was occupied by slightly raised, dull red patches from a quarter of an inch to an inch in diameter. In addition to these lesions were a few distinct urticarial wheals, and, espe-

cially on the legs, a large number of pigmented patches of varying shades of brown. Under treatment with salicylate of soda the eruption disappeared within a week. Upon the suspension of this remedy a fresh rheumatic attack followed, the knees and ankles being swollen, and urticarial and erythematous lesions appearing upon the extremities. With the resumption of the treatment all the symptoms again disappeared.

[This case seems to us to present the symptoms of erythema multiforme rather than urticaria—EDS.]

Frambœsia Tropica and Tinea Imbricata.—KOCH (*Archiv f. Dermatologie und Syphilis*, Band lix., Heft 1), during a journey in the tropics, noted the great number of diseases of the skin prevalent in New Guinea and the neighboring island groups, and gives a brief account of the two most commonly met with, viz., frambœsia and tinea imbricata. He thinks it probable that the disease known in various parts of Africa as frambœsia is not the same affection which is thus named in the South Sea. The South Sea frambœsia is a contagious disease, and can be inoculated from one person to another. One attack confers immunity, and in the regions where the malady is indigenous it is almost exclusively an affection of childhood. The cases which Koch saw occurred in children from one to twelve years old. The legs, arms, the lower portion of the back, the buttocks, and in isolated cases the face and nape of the neck were covered with ulcerations, circular in shape, arranged in groups, and occasionally confluent. They varied in size from a hemp-seed to a five-mark piece, projected above the level of the surrounding skin and appeared like swollen granulations. The newest lesions resembled the pustules of variola, forming elevated nodules covered with epidermis and showing a decided umbilication. The largest nodules had always lost the epidermis, secreted a seropurulent fluid, and were covered with moist crusts, beneath which there was a cushion-like, granulating mass. Some of the largest resembled very closely flat condylomata, especially when they were situated in the region of the anus or the genitalia. Various stages of the lesions were present in one and the same child, the nodules not appearing simultaneously, but new ones arising from time to time until the patient's susceptibility is exhausted.

The duration of the disease is from some months to a year and more. When small children are severely attacked it may prove fatal. When it is introduced into an island where it has hitherto not occurred, adults as well as children are affected; but Koch never heard that Europeans were attacked by it. Concerning the cause of frambœsia, nothing reliable is known.

Tinea imbricata occurs chiefly in the South Sea Islands, and is due to a fungus akin to the trichophyton. Like ordinary ringworm, the disease occurs in circular patches, but, unlike the latter affection, it does not produce rings through healing of the centre of the patches. The diseased epidermis is covered with thin lamellæ which are arranged like the tiling of a roof, a feature which gives the affection its name. It is extraordinarily frequent in adults, almost every inhabitant of some of the villages being affected. The general health is not affected; but chronic swelling of the lymph glands, especially the inguinal and femoral glands, is very frequent.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

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Causation of Beriberi.—An epidemic of beriberi at Diego-Suarez, in 1900, which included 180 cases, with 37 deaths, was observed by DE SCHUTTELAER (*Archives de médecine militaire*, 1901, p. 470), to whom it appeared that he had to do with a disease of alimentary origin. In a prior epidemic at the same place the addition of an ounce of fat to the day's allowance of food was followed by a rapid disappearance of the trouble, but in this case the same treatment failed to have any effect. The complete elimination of rice from the diet, however, and the substitution of army bread and ordinary bread ended the difficulty, excepting in the case of a number of Chinese laborers, who continued the use of rice, which was old, decorticated, and changed from the normal. Fresh, unhulled rice is believed by him to have no influence in producing the disease. He recommends the disuse of rice and the administration of fat as preventives. [In 1898 A. G. Vorderman, of the Dutch Colonial Medical Service, started the rice theory with the announcement that those who eat white rice are more likely to be seized than those who eat the red sort, in which the pericarp is retained. Inquiry showed that in jails where white rice was used 27.90 per cent. of the inmates were seized, against 0.09 per cent. of those of jails where the red was served. Where both sorts were eaten the ratio was 2.40 per cent. Eijkman has reported an epidemic of polyneuritis in fowls fed on white rice; they recovered when red rice was given. F. Grimm has pointed out that Europeans in Japan are immune so long as they adhere to European diet, and that the disease disappeared from the Japanese Navy when the ration was reconstructed on European lines, and from the Japanese penal institutions after reform in diet and in the preparation of the same. Manson believes that the improvement in the navy could have been no more than a coincidence, and that other hygienic reforms introduced about the same time had a favorable influence. He cites an epidemic in Singapore jail which affected only the male prisoners, whose quarters were damp, while the women, whose quarters were dry, were untouched, in spite of the fact that their food and drink were the same. —C. H.]

Coincidence in the Appearance of Anopheles and of Malaria.—A. BILLET, of the French Army (*Comptes rendus de l'Académie des Sciences*, 1901), observed that the mosquitoes which were first to appear in the vicinity of Constantine toward the end of May, at which time there were no cases of malaria, were all of the genus Culex. Not even in the larval state did he find a single Anopheles. Toward the middle of June he began to find them,

however, and in a number which contained human blood he observed the sporocysts and the characteristic sporozoites of malaria. At about the same time cases of malaria began to present themselves at the hospital from the localities where the Anopheles had been found. [The question arises, If there were no antecedent cases, how did the Anopheles become infected? On this point the experience of the younger Manson, recently deceased, is of interest.

In September, 1900, he allowed himself to be bitten in London by infected mosquitoes brought from Italy, and had an attack of benign tertian. The presence of the parasites in his blood was demonstrated in the usual manner. Recovery under quinine was rapid, and he remained in his normal condition of health until May 30, 1901, when he began to be ill, and then had two paroxysms of tertian fever. Examination of the blood again demonstrated the malarial parasite.—C. H.]

Neutral Red as a Means of Detecting Bacillus Coli in Water.—Several investigators have found that media containing neutral red are changed in color to canary yellow by B. coli communis, but not by B. typhosus. The reaction was found to be constant in an investigation of a large number of races of the organism, but it was shown also that it is brought about by certain other bacteria, including B. tetani, B. œdematis maligni, B. anthracis symptomatici, and B. enteritidis. Most of the aërobic pathogenic bacteria were tested with negative results. In order to ascertain whether the reaction affords a rapid means of detecting B. coli in water and of estimating the number present, R. H. MAKGILL (*Journal of Hygiene*, October, 1901, p. 430) undertook a series of experiments, which led to the conclusion that a water producing a typical canary yellow in neutral red media within forty-eight hours in bouillon, and accompanied in glucose-agar by green fluorescence and gas formation, may be considered to contain B. coli. He found that B. tetani and B. œdematis maligni produce the same appearance as B. coli in glucose-agar, even when the surface of the medium is exposed to the air, but in the bouillon the anaërobes produce the reaction only when oxygen is excluded. B. mesentericus was found to change the red to a dull orange both in bouillon and in glucose-agar.

In bouillon a reaction could be obtained in every instance within twenty-four hours, even with dilutions containing from one to five organisms per cubic centimetres. In extreme dilutions the reaction did not extend to the surface of the fluid in twenty-four hours, and the lower portions had a more orange tint than when the organism was plentiful. With numerous bacilli present the reaction occurred within twelve hours.

W. G. SAVAGE (*Ibid.*, p. 437) finds that it is not a matter of indifference what strength of glucose and of neutral red is used, for if an excessive amount be added it may not be reduced. To determine whether if B. coli is present, it will always give the reaction, and whether it is the only organism which, under the conditions of the test will give the reaction, he instituted a series of experiments which led to the conclusion that, while a positive reaction is not absolutely diagnostic of B. coli, in the vast majority of cases it points to its presence; that while a negative reaction does not absolutely exclude the

organism, it makes its presence highly improbable; that the test is very easy of application, and is of great value in the routine examination of water.

Growth of Bacteria through Porcelain Filters.—It is generally accepted that ordinary water bacteria can grow through the lacunar spaces of porcelain filters in a few days' time, but that the pathogenic species, which gain access through sewage contamination, cannot multiply, because of the absence of conditions essential to growth. Some observers have held that the chief obstacle is a lack of suitable nutrient material, and that the addition of broth will remove it. Contradictory results published by a number of investigators led Major W. H. HORROCKS (*British Medical Journal*, June 15, 1901, p. 1471) to reinvestigate the subject, using Chamberland-Pasteur and Berkefeld candles. Broth, sterilized sewage, sterilized diluted sewage, sterilized ditch water, and sterilized drinking water, all inoculated with the bacillus of typhoid fever, were used in making the tests. With the Berkefeld candles the results were uniformly positive, the organisms appearing as early as the fifth day and at latest on the eleventh. The candles used were cleaned by brushing or by boiling, and then further tested. The one cleaned by brushing yielded the bacillus; the other, as was to be expected, did not. The same tests made with the Chamberland-Pasteur candles gave negative results in every case, even after three weeks. The difference in the two sets of results is attributed to the larger size of the lacunar spaces and to the consequently diminished immobilizing and devitalizing influences. The Pasteur filter, with proper care to prevent passage through flaws or imperfections, ought, therefore, to give perfect protection against water-borne typhoid, but the Berkefeld should be sterilized in boiling water at intervals of three days in order that the bacteria which have already penetrated shall be destroyed.

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